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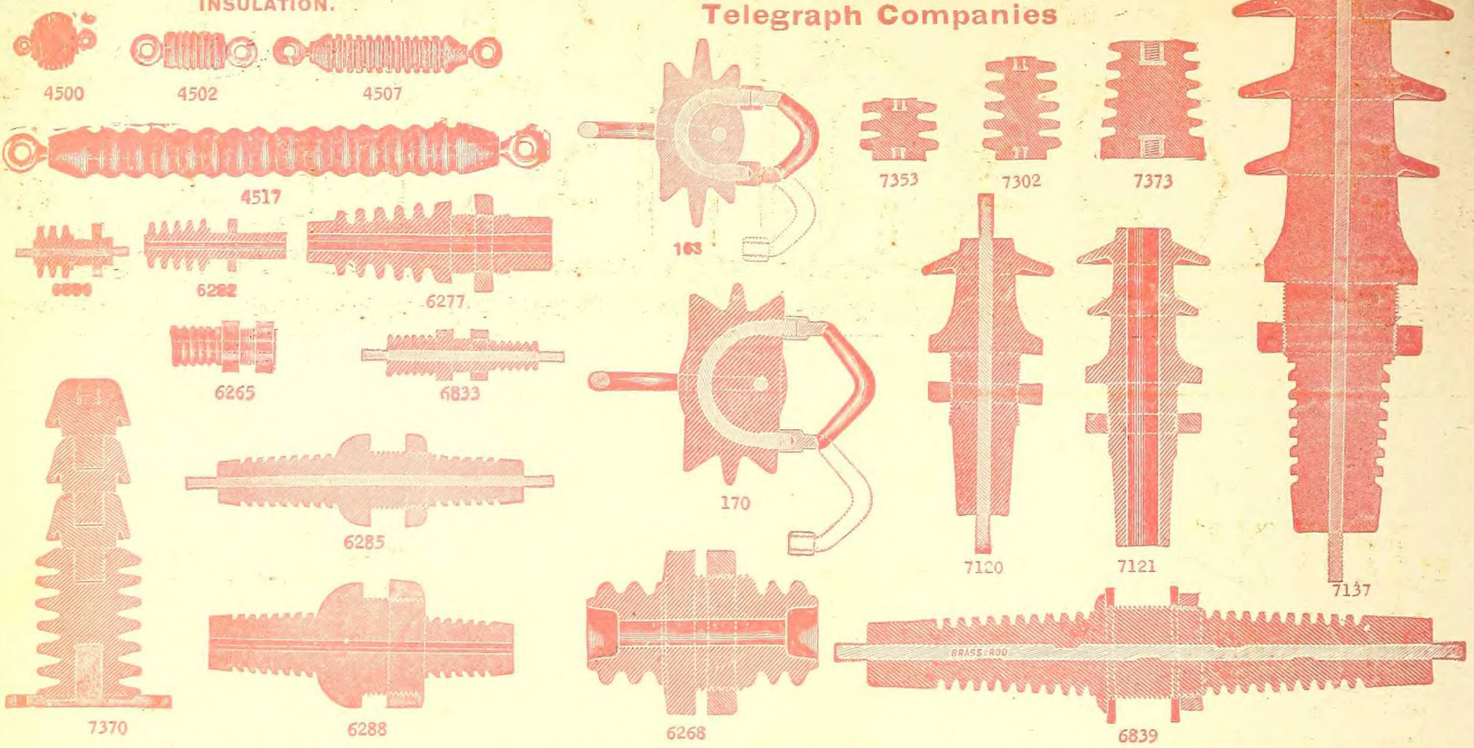

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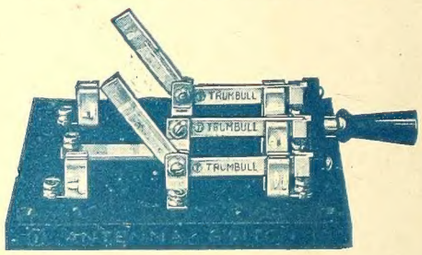

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"The Obsolete Submarine"

IN analyzing past and present means of warfare, we invariably find that it is possible to combat weapon by weapon. Thus the early cliff dweller could combat his club-swinging adversary by means of a club; the one swinging the club most adroitly won. You can combat the lance with a lance; a sword with a sword; gun against gun; one cannon can fight another with a cannon; one battleship can attack and combat successfully another battleship. But—and here we have a singular exception, the paradox of the present war—you cannot fight one submarine with another submarine. Nay, you cannot properly combat—as that term is understood—the submarine with any present means. For we cannot fight what we cannot see; to-day, as in the past, the most dangerous enemy is the unseen one.

The modern submarine is dangerous only because of its invisibility. If we find a means to make it "visible" the submarine will become obsolete. When this moment arrives the battleship will come into its own again, as well it may.

The present submersible is made possible only due to the use of electricity; it could not exist without that agency. Our imagination need not be stretched unduly to presume that electricity will, in the not too distant future, be employed to render the submarine harmless. Indeed, scores of our greatest scientists all over the world are working along these lines, our own FESSENDEN having already obtained certain results which seem exceedingly promising.

Speaking generally, a ship is safe in a harbor; it is endangered only in the open sea. If the captain has accurate knowledge of the whereabouts of the submarine and if he runs away from it at full speed his ship, as a rule, cannot be overhauled by the relatively slow undersea craft. The obvious problem then is to locate the submarine when it is as yet from three to five miles distant. It is, of course, necessary also to know in what direction the submarine is located, because it may make for the ship, running submersed, without showing its periscope.

How can we locate it then? The problem does not present unsurmountable difficulties. Several means may be used. We can imagine a very refined magnetic indicating detector mounted below water on each side of the ship. If this detector is sufficiently sensitive to large iron or steel masses (it could be shielded against its own ship) it would become a simple matter of locating the submarine or even a mine. For it must not be forgotten that a submarine of necessity sends out a considerable magnetic flux.

Another means to detect submarines lies in the use of some form of etheric waves. We can imagine an apparatus, say at the bow of the ship, sending out waves below the water while a suitable detector at the stern, also below water, is used to register the "echo" and its intensity. The original waves striking the submarine will be reflected and bent back. The intensity of these reflected waves could be made to read off on a direct recording scale, giving the distance of the submarine in miles. Recent researches show the possibility of sending etheric waves below water, so we may be sure that the interesting problem of locating submarines will not remain unsolved for any great length of time.

The above presents such a rich field of opportunities for the investigator that it seems worth while to bend all our energies toward its successful solution. Humanity will breathe easier when the now treacherous submarine can be successfully combated.

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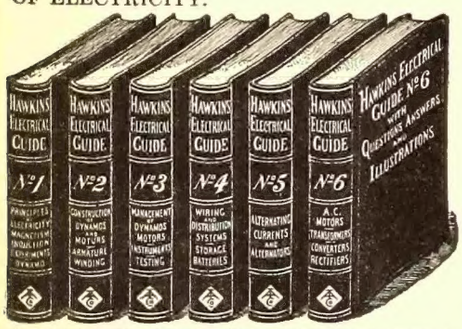

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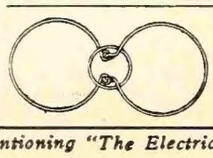

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Vol. III. Whole No. 27 JULY, 1915 Number 3

Edison Perfects the "Telescribe"

THOMAS A. EDISON, at sixty-eight, announces the perfection of the telescribe, a combination of telephone and phonograph, by which the telephonic conversation of persons 3,000 miles apart can be perfectly recorded on a wax record. Its completion gives Mr. Edison the credit for more than 1,500 inventions and more patents than ever have been issued to any other individual.

With the telescribe, "canned evidence" of a litigant's own words in his own voice may be heard by a jury.

The telescribe consists of a sensitive telephone for desk use with controlling buttons to operate a recording machine nearby. It is so sensitive and so adjusted that the slightest vibration is recorded.

When he invented the carbon telephone transmitter and the phonograph, thirty-eight years ago, Mr. Edison conceived the idea of the telescribe. More than a generation of invention and scientific development is centered in the new apparatus, which Mr. Edison says "the world will soon recognize as a great commercial asset. It makes the telephone more useful, the phonograph more valuable and both more necessary."

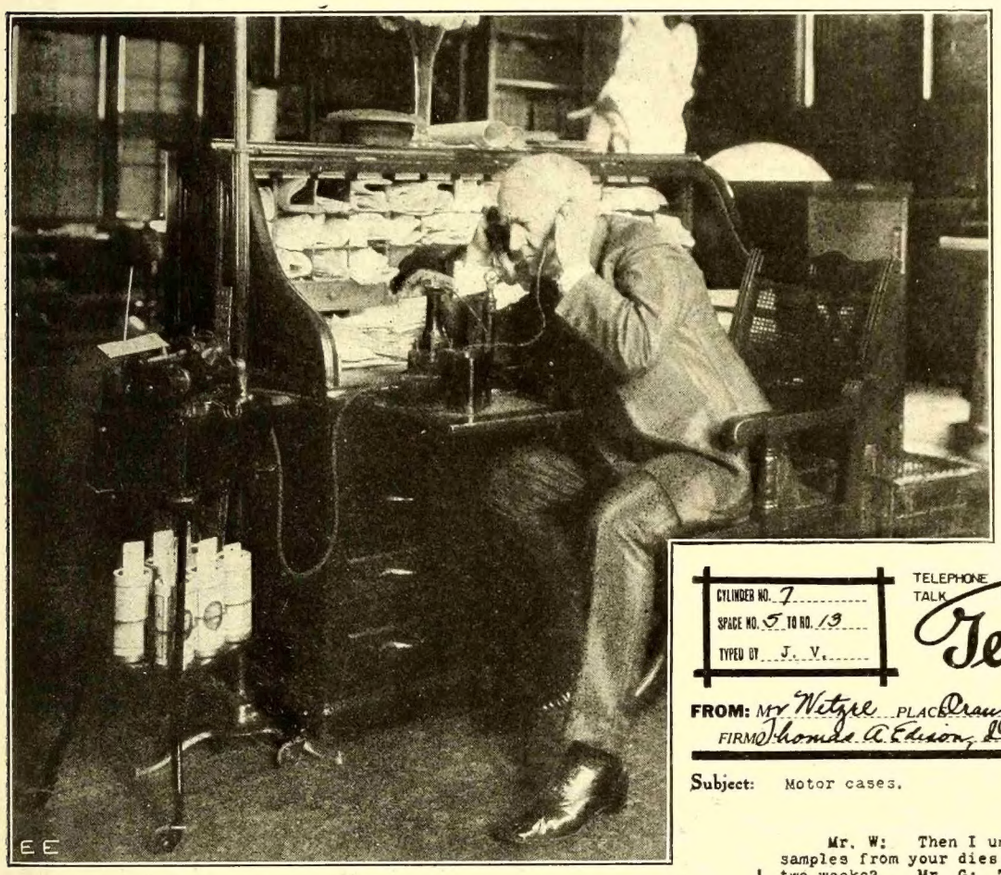
Had there been a telescribe at either end of the transcontinental wire between the White House and the Panama-Pacific Exposition when President Wilson spoke the words that opened the fair, his sentences might have been recorded and perpetuated for posterity.

After the words of the telephoning persons are recorded on the wax record if important enough, it may be preserved, or it may be used 100 times if the intelligence on it is taken by a typist and the record "shaved." What is known as a "telescript," a patented form somewhat similar to a telegram and here shown, is signed and mailed to one of the parties that has talked, should he desire an exact copy of the entire conversation. In case of a long distance telephone call, which involves considerable expense, in the absence of the person desired, one in the office need only to press a button and the person at the other end may speak what he has to say into the phonograph to be listened to later by the person for whom it was intended.

More than a generation of invention and development is centered in the telescribe.

The two arts—telephonic and phonographic—which it combines, have been closely associated in Edison's mind from the earliest development. His experience with diaphragm action in the carbon transmitter in 1876 led immediately to the invention of the phonograph in 1877, and we find his early prophecy of the telescribe in these words:

(*Continued on page* 85.)



At Left: Mr. Edison Using His Newly Perfected "Telescribe."

CYLINDER NO. 7
SPACE NO. 5 TO NO. 13
TYPED BY J. V.

TELEPHONE TALK RECORDED ON THE TELESCRIBE

Telescript

DATE 4/3 1915
HOUR 10 MIN. 35 am
SPEAKING 2 MIN.

FROM: Mr Wetzel PLACE Orange TO: Mr. Grey PLACE Orange NJ
FIRM Thomas A. Edison, Inc FIRM E. M. Grey M'f'g Co.

Subject: Motor cases.

Mr. W: Then I understand, Mr. Grey, if we approve the samples from your dies today, we can expect deliveries within two weeks? Mr. G: That's sure, if I can get your order for at least five thousand (5,000). Mr. W: The order for 5,000 goes tonight with the approved samples, but I've got to know we will get the first cases by April 15th, delivered 500 a week after that. Mr. G: You get me the approved samples with the order, and I'll do my part. Mr. W: Say, Grey, I want you to note the change we made in the top lugs----we've made them a little heavier. Don't forget to change your dies before you commence the run. Mr. G: That will be all right.

Approved O. J. Wetzel
Production Mgr.

Above: A Specimen "Telescript" or Record Made on the Edison Telephone Message Recorder. It Works Automatically and Saves a Lot of Time in Handling Everyday Business.

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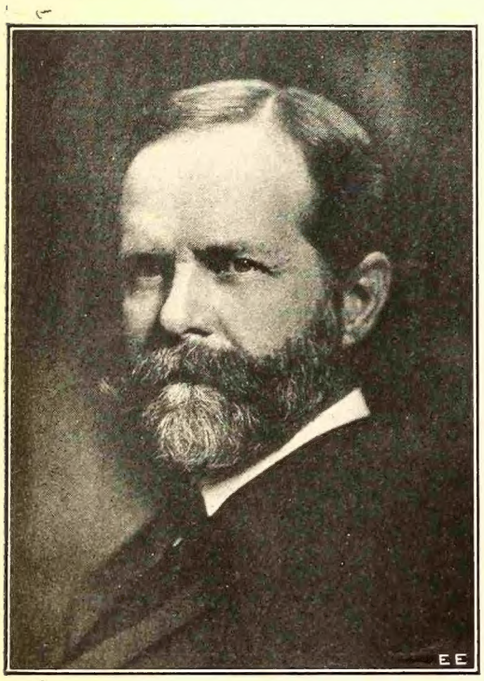
A Day With William J. Hammer

By Samuel Cohen

IT was a mid-week day, not long ago, when I took advantage of the invitation extended by William J. Hammer to visit him in his laboratory in New York City.

First and foremost, Mr. Hammer is a consulting electrical engineer, and was one of Edison's earliest assistants at his Menlo



Mr. William J. Hammer the Well-Known Consulting Engineer of New York City.

Park laboratory during the development of the incandescent lamp, telephone, phonograph, electric railway, etc. This gentleman was one of the real pioneers of the incandescent electric lamp and in the development of the transmission of electrical power, both here and abroad, having been chief engineer of the English Edison Co. in 1881-2, also chief engineer of the German Edison Co., known as the Allegemeine Elektricitaets Gesellschaft, in 1883-4.

In 1883 Mr. Hammer invented and constructed the first motor-driven electric "flasher" sign, now universally employed. This sign, which flashed the name "Edison," letter by letter and as a whole, by means of a commutator or "flasher" driven by an electric motor, was placed on top of the Edison Pavilion at the International Health Exposition in Berlin, Germany; also a simpler form was constructed to be operated by hand as early as 1881, and it was used for a year at the Crystal Palace Exposition in London.

After we had had an interesting chat this great man conducted me to his marvelous laboratory, which is seen in Fig. 1. It is in this laboratory where the most wonderful experiments and discoveries imaginable in phosphorescent substances, X-rays, ultra-violet rays, radium phenomena, selenium, etc., have been conducted.

This savant is one of the leading authorities on selenium in this country and has compiled a remarkable bibliography upon the subject. Many different types of selenium cells have been devised for various purposes. Some of these he has invented and patented, and has also perfected automatic devices for starting motors, controlling gas and electric street lights, for opening iron window shutters in the morning and closing them in the evening, automatically firing cannon, the prevention of boiler explosions, protecting safes, etc. This untiring worker has also developed, to some extent, a system of "seeing over a wire" and has patented a selenium photometer. All these devices are operated with selenium cells. Various experiments have been carried on in radio-telephony by the use of selenium cells, and wireless has been employed for domestic purposes in his house, for calling servants, ringing bells, etc. He was for a time associated with the late Prof. Ernest Ruhmer, of Berlin, Germany, who is well known for his experiments in radio-telephony and selenium-cell work, as well as for numerous technical publications.

To resume: In a few minutes the laboratory became dark and the wizard performed for me several extremely interesting experiments. For instance, I was told to watch a large bouquet of artificial flowers, which appeared in their natural color. A Weintraub-Steinmetz mercury arc lamp was now lighted and kept in operation for a few moments. The lamp was then extinguished by opening a switch. The room was dark as pitch, but the flowers, roses, tulips and lilies, which could not be seen at all a minute before, now *glowed beautifully* with many different colors. Further demonstrations included numerous bottles containing chemical and mineral substances, which by exposure to the mercury lamp also radiated glowing rays, and each bottle had a different color. Figures, letters, statuettes, even model aeroplanes and balloons, etc., around the room, all became brilliant. It was explained that all these objects were coated with some special phosphorescent substances and, when stimulated by the mercury lamp rays, they will give off considerable light for a long time. The phosphorescent mixtures used on watch and clock dials and containing radium salts were originated in this laboratory. After years of study it was discovered how to combine phosphorescent and fluorescent substances so as to produce practically any brilliant color in the dark when the substances are stimulated by the mercury arc lamp or ultra-violet light, sunlight, etc. A basic patent upon this discovery has been allowed.

Mr. Hammer has spent an unbelievable amount of study on the phenomena which occur inside and outside of different types of vacuum tubes. Note the many shapes and kinds of tubes seen on the shelves of his laboratory. Another ingenious device I saw was a machine driven by electric motors, by means of which can be illustrated, mechanically, upward of 100 different forms of physical phenomena.

No less than 34 long years were expended in systematically collecting various kinds of electric lamps in this country and in Europe. This was done for the purpose of showing the complete steps in the development of the incandescent electric lamp, from the earliest work of Edison, Swan and others to the latest nitrogen-tungsten lamp. Five large glass cases, four of them 10 feet long, contain the collection, which is exhibited in the rooms of the American Institute of Electrical Engineers, 25 West Thirty-ninth street, New York City. One of these cases is shown in the photograph Fig. 2. The collection contains more than 1,000 different lamps, and this collection which Mr. Hammer has termed the "history of an art," represents the only art in the world of which such a record has been made. It is thoroughly complete and without a single important missing link.

The radiant efficiency of the original carbon-filament incandescent lamp was about .43 of 1 per cent.; that of the tungsten lamp about 5 per cent., and that of the new nitrogen-tungsten lamp is about 10 per cent. On the other hand, the light of the fire-fly and the "pyrophorus noctilucus" or, as commonly called, the *Brazilian beetle*, have an efficiency of 96.5 per cent. as shown by measurements made by Professors Langley and Very with the bolometer,

Fig. 1. The Marvelous "Hammer" Electrical Laboratory, Where Every Conceivable Interesting Scientific Instrument is to be Found.

and also by Coblentz with the thermopile. This investigator believes that "cold light" is the real light of the future. Already photographs have been taken by the light of fire-flies and other forms of "cold light" in his laboratory.

Photograph 3 shows a case of historic wires which have been collected, now all joined in one continuous circuit and containing sections of wires and cables which at various times formed parts of the most important electrical circuits in the history of electricity. At the top of the case is a piece of wire over which Prof. Samuel F. B. Morse sent the immortal first message by telegraph, *"What hath God wrought?"* Immediately below this specimen there is a length of a few inches of wire through which Prof. Alexander Graham Bell and Thomas A. Watson, his assistant, made all their early experiments on the telephone from 1875 to 1877, and through this wire passed the *first* electrical transmission of audible speech in the world in the year 1875.

The third of these historical wire mementos is a section of the Atlantic cable over which the first successful message was sent between the old and new worlds by Cyrus W. Field.

In the center of the photograph will be seen a safety fuse or plug used in London, England, on Jan. 12, 1882, to close the circuit of the first incandescent lamps ever lighted from an electric lighting central station in the history of electricity. This interesting event took place at the Holborn Viaduct Central Station, and it was Mr. Hammer himself who made the initial connection. Beneath the fuse is a portion of the first "Sprague" trolley circuit used at the historic plant at Richmond, Va., in 1888.

The sixth is perhaps the most interesting of all the relics, being a section of the deep-sea portion of the new American-Pacific cable, through which the initial "around the world" message was sent July 4, 1903, by ex-President Roosevelt. It is interesting to note that the Postal Telegraph

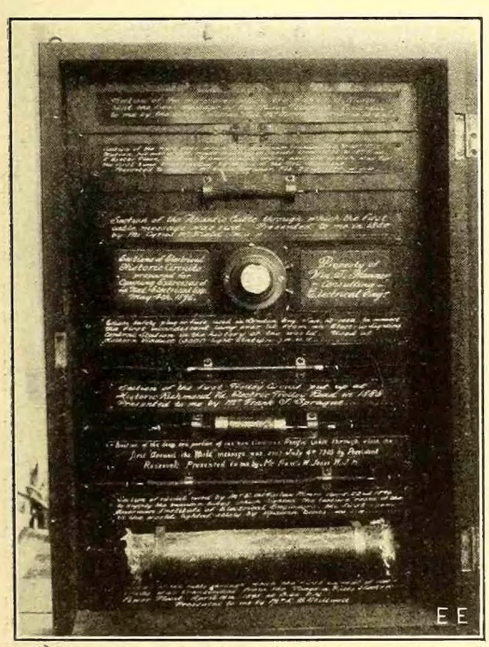


Fig. 3. Case of Historic Wires and Cables in the Wonderful W. J. Hammer Collection.

Co. borrowed this exhibit case of historic wires and connected it in the circuit. The message thus passed through all the old wire specimens. The seventh is a section of the wire through which the electricity was sent to illuminate the headquarters of the A. I. E. E. by Moore's system of vacuum tube lighting, this being the first room in the world so lighted. The eighth and last is a section of the cable through which the first electric current was transmitted from the Niagara Falls electric power plant, April 16, 1895.

Mr. Hammer is a fellow and life member

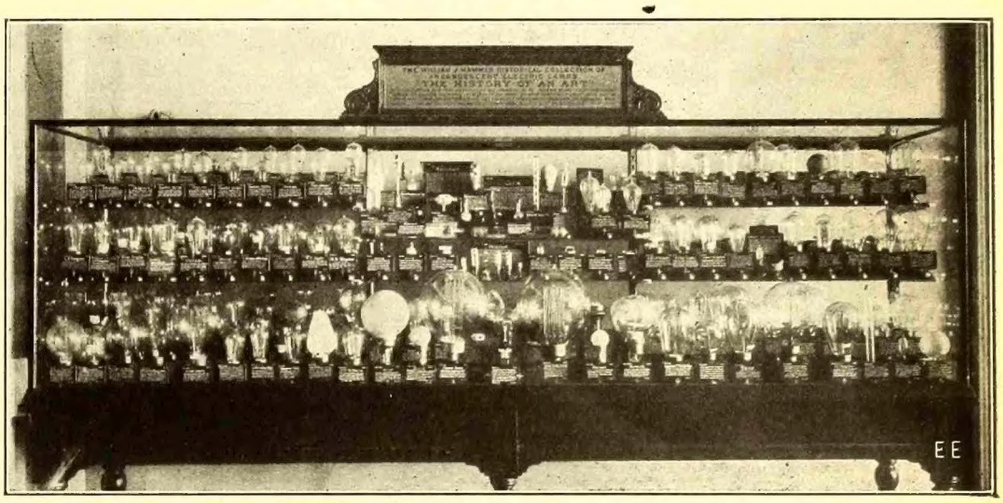


Fig. 2. Exhibit of Incandescent Lamps Prepared and Collected by Mr. Hammer. No Important Link in the Development of the Incandescent Lamp is Missing.

of the American Institute of Electrical Engineers, fellow of the American Association for the Advancement of Science and has been vice-president of the American Institute of Electrical Engineers, the New York Electrical Society and the Aeronautical Society of America and is a member of many other bodies. Also the Elliott Cresson and the John Scott medals of the Franklin Institute, the "Grand Prize" of the St. Louis Exposition of 1904, and several other medals here and abroad have been awarded this profound thinker and scholar.

Some of his numerous press contributions include a book on "Radium and Other Radio-Active Substances;" also special radium articles for the Encyclopedia Americana; editorial collaboration on the Aero Club's book, "Navigating the Air," and in conjunction with Hudson Maxim, the "Chronology of Aviation for the *World Almanac* of 1911 was compiled. This has since been reprinted and is the accepted authority upon the history of the art of flying. His multifarious duties have included that of secretary and expert of the Aeronautics Committee of the Hudson-Fulton Celebration of 1909, besides appearing for the famous Wright brothers in all their aeroplane patent suits.

Few men, perhaps, in their allotted cycle of life have been interested or identified with a greater number of engineering projects than this pleasant-faced man who counts among his innumerable personal friends the leading scientists and engineers of every country under the sun.

EDISON MEDAL GIVEN TO DR. ALEXANDER BELL.

Dr. Alexander Graham Bell, inventor of the telephone, was cheered long and heartily by a company that filled the auditorium of the Engineering Societies' Building, New York City, on May 18, where he had been summoned to the annual meeting of the American Institute of Electrical Engineers, to receive the Edison medal for meritorious achievement in electrical science.

John J. Carty, chief engineer of the American Telephone and Telegraph Company, made the presentation, after Prof. Thomas A. Watson, of Boston, mechanical expert for Bell at the time of the telephone invention in 1875, had spoken of some of the trials of the experimental period.

"The telephone has developed so much in recent years," Dr. Bell said in accepting the medal, "that I have almost forgotten my part in it. When I think of the present system I realize what other men have done, and how much we owe to them. To me Prof. Watson represents the past of the telephone, Mr. Carty represents the present and the American Institute of Electrical Engineers represents the future.

The question with me is: Are you not some day going to see by telephone? The end has not come. I am struck by the fact that nearly all recent developments has had to do with vibration. I wonder what it may not lead to, when our engineers turn their genius to some of the many other fields of the work."

EDISON PERFECTS THE TELESCRIBE.

(*Continued from page* 83.)

"Among the many uses to which the phonograph will be applied are the following: Letter writing, and all kinds of dictation without a stenographer; connection with the telephone, so as to make that invention an auxiliary in the transmission of permanent and valuable records, instead of being the recipient of momentary and fleeting communication."

Ground wires for metal mouldings must be of copper at least No. 10 B. & S. gauge.

SOME ELECTRIC LIGHTING RULES.

The following simple rules should be observed in considering lighting installations:

Don't work in a flickering light

Don't expose the eyes to unshaded lights in the direct range of vision.

Don't judge illumination by the brightness of the lamps.

Avoid extensive contrasts.

Use the right type of globe, shade or reflector.

Make sure that the illumination is sufficient.

Keep lamps, globes and reflectors clean.

Make sure that lamps are in the right position.

The Panama Canal was begun nine years ago and has cost $310,000,000; within the same space of time the Bell Telephone Company has spent twice that amount in its engineering construction work on the transcontinental telephone line alone.

New Inventions in Photoplays

NO—the photograph we see below is not that of a band of Chinese conspirators catching secret wireless messages! It depicts an interesting moment in the Pathé moving picture production, "The Exploits of Elaine," being from episode No. 21, entitled 'The Listening Ear."

The Movie Villain, "Wu Fang," and His Men Listen to "Craig Kennedy's" Conversation by Means of the Listening Ear, or, As We Know It, "The Detectaphone."

The story, of course, revolves about the leading characters of "Wu Fang" and "Craig Kennedy," the scientific detective. The Chinaman, "Wu Fang," pits his cleverness and scientific abilities against those of the well-known detective character in the story of the photo-play.

The vital moment here shown is that when "Wu Fang" manages to have his assistants install a "Detecta-phone," or as it is termed in the picture more mysteriously, "The Listening Ear," so that he and his assistants, who are located in the same building as "Craig Kennedy's" office, can overhear what he has to say to his assistant.

This picture is one of the most interesting, in several ways, of those so far shown in the famous Pathé film feature, and it is very exciting to see "Craig Kennedy" locate the hidden Detecta-phone wires in his office by means of the "Kennedy Galvanoscope." This galvanoscope is one of the largest ever seen in captivity, to put it mildly; but of course it is necessary to use large instruments which will show up in the proper way on film pictures, etc. To resume: When the instrument is brought near the hidden wires by "Craig Kennedy" the leaves of the galvanoscope, which measure about 4 inches in length, are seen to flap back and forth in a very *wonderful* manner. However, the general features of the instrument shown are undoubtedly brought out in a very strong manner, so that the uninitiated in the audience will be sure to gain the general underlying principle involved in the apparatus used.

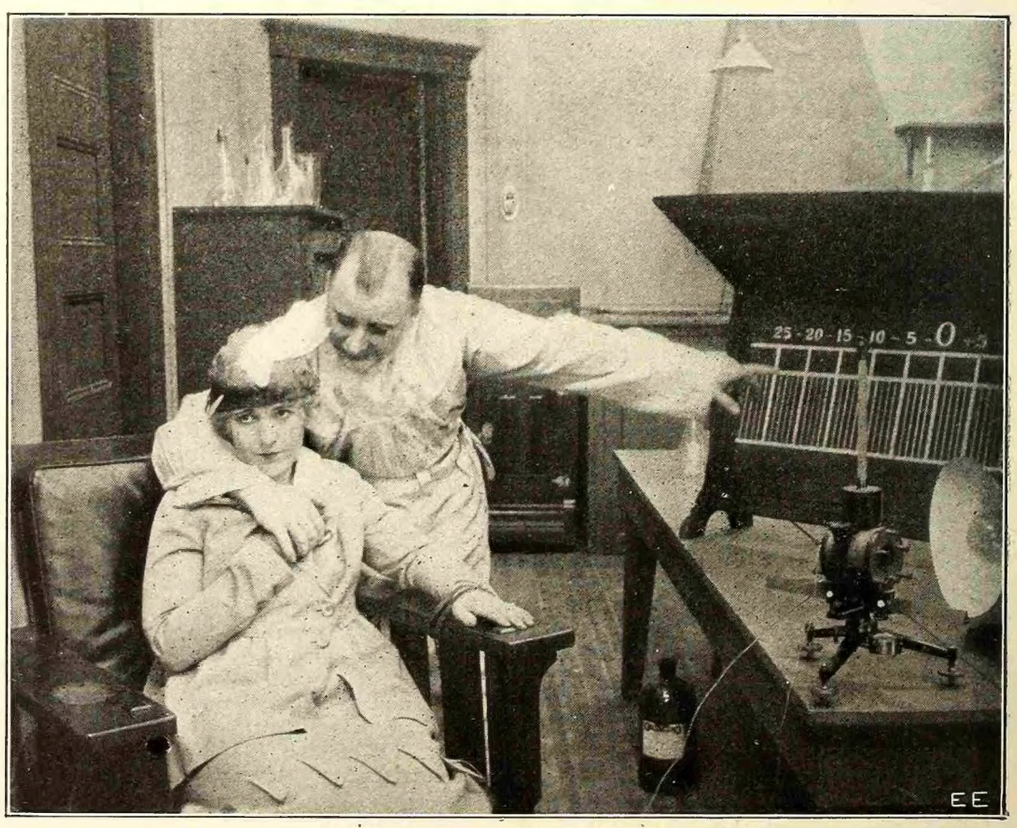
An electrical device which has been mentioned a number of times in scientific journals in the past few years is that known as the Sphymograph, or the instrument which can record the state of human emotion. This apparatus is seen in the picture herewith presented, which is taken from the Pathé film entitled "The Exploits of Elaine" and depicts the famous characters of "Craig Kennedy," the scientific detective, portrayed by Arnold Daly, and "Elaine Dodge," in the person of Miss Pearl White.

In the picture here presented "Craig Kennedy" is explaining and demonstrating the Sphymograph to "Elaine Dodge." Later this remarkable instrument is successfully employed to secure the correct address of the Chinaman, "Wu Fang," who is always scientifically scheming against the science and art of "Craig Kennedy."

The principle of this instrument is based on the fact that if a suspected person, such as a criminal, is successively plied with statements along the line of information desired, that when the correct indication is spoken, that the heart and therefore the pulse will invariably and faithfully momentarily increase in activity. The person's face may not show this (as is well known, of course, in the case of expert criminals), but, thanks to the Sphymograph, which consists of a sensitive microphonic contact arrangement strapped to the wrist of the person suspected, it is made possible for a sensitive galvanometer, seen in the picture, to throw its moving beam of light across the scale, which we also see in the illustration. For instance, in this "movie" story the young lady accomplice of "Wu Fang" is taken to "Craig Kennedy's" laboratory and when he has her placed in the chair the special wrist band is attached and the action taking place is as follows:

The detective repeats numbers on Pell street, where "Wu Fang's" headquarters are supposed to be located, and the series of numbers repeated begin with "1." When he has reached "No. 14" the Sphymograph faithfully records an internal change in the emotion of the young lady by swinging its beam of light from the galvanometer clear across the scale.

Thus it is seen that while the instrument does not read the human mind in the ordinary sense of the word, it truly does read it nevertheless, even though in an indirect yet positive manner.



The "Sphymograph" is Demonstrated to "Elaine Dodge" (Miss Pearl White) by "Craig Kennedy" (Mr. Arnold Daly). Scene in the "Exploits of Elaine," Pathe Film.

This may be likened in a general way to the method used in the courts of India

(*Continued on page* 102.)

PASSAIC HAS A WIRELESS CLUB.

At the first meeting of the winter season, the Wegotta Radio Club, of Passaic, N. J., reorganized with three new members. The club started with five members two years ago for the purpose of advancing the knowledge of wireless telegraphy among its members and to bring together the operators of amateur wireless stations in Passaic and vicinity in order to discuss topics pertaining to radio communication and take part in lectures which are given from time to time at the club room.

All the members are licensed by the government to operate stations, and four have been appointed relay stations of the American Radio Relay League, which is an association of amateur operators whose stations make up a chain stretching the entire length of the Atlantic Coast and connect the Atlantic with the Pacific across the northern part of the country. Any of the operators of appointed relay stations may originate messages and thru this series of relay stations, send messages to almost any part of the country.

The Wegotta Radio Club of Passaic meets on the second and fourth Thursday of each month at No. 33 Pennington avenue. The secretary will be glad to hear from any one who is operating a wireless station and wishes to join the club. There are no dues or initiation fees.

The members are: T. E. Ackerman, H. V. Berger, J. L. David, R. Huerdin, C. N. Humprey, E. S. Pearl, W. F. Tense, J. M. Thomson, G. S. Yerbury.

HUGE TELEPHONE AT EXPOSITION.

The accompanying photograph shows a desk telephone set which measures 19 feet high. This gigantic telephone was placed in the rooms of the Western Electric exhibit at the San Francisco Exposition. This telephone in appearance is a replica of the ordinary telephone used every day. Compare it in size with the common desk set shown in the picture. This exhibit is one of the most interesting at the exposition. All kinds and styles of telephone apparatus are shown and demonstrated.

Mammoth Telephone Model Exhibited by the Western Electric Co. at the 'Frisco Exposition.

Uncle Sam's Battleships at Night

Many wonderful electrical sights were produced during the recent review of Uncle Sam's battleships on the North River, New York City. The photograph herewith shows two of the battleships illuminated with electric lights and the gigantic searchlights flashing their powerful beams of light into the night. Some of these searchlight beams were seen many miles distant. Note the illuminated star between the masts on the Battleship "Texas" at the left. Hundreds of horse-power of electrical energy were used in the lighting of the battleships, each one supplying its own power of course.

Photo (C) by International News Service.

Beautiful Effect at Night on Hudson River, New York, When Uncle Sam's Mighty Dreadnoughts Threw Skyward Their Powerful Searchlight Beams.

During their stay for the review a boat race took place at night, the river being well lighted by the searchlights of the fighting-ships. President Wilson was an interested spectator at the race, which was won by the husky crew of the mighty "Wyoming." A single searchlight beam marked the finish line for the boats; rather a novel race marker indeed.

The whole sky was alive with intercrossing beams of light during the evenings and a most beautiful effect, impossible to describe, was produced when, for instance, half a dozen searchlight beams were played in one direction over the sky, while a similar battery of light beams was played past them in the opposite direction. Some of the war vessels evidenced the exercise of great ingenuity in arranging spectacular illumination effects, which were highly enjoyed by the large crowds parading Riverside Drive nightly.

ELECTROPLATING WITH COBALT.

Probably no other paper presented at the spring meeting of the American Electrochemical Society is of such general interest as the one by Messrs. Kalmus, Harper and Savell, dealing with the electrodeposition of cobalt. This is on account of the facts brought out indicating that cobalt may well replace nickel in a great many applications where nickel plating is now used. For the past 20 years nickel plating has been widely utilized to protect other metals, such as iron, from oxidation, and to give a finished surface which would take a polish, have an attractive appearance, and not easily corroded. The performance of nickel has not, however, been ideal. Peeling of the nickel has not been uncommon, and oxidation is not unknown.

Cobalt is in appearance somewhat similar to nickel, but it has a bluish cast. Its specific gravity is about 8.8, or nearly the same as nickel, but its hardness is greater than that of either nickel or iron. This is a very desirable quality in a plating material. The electrical conductivity is slightly greater than that of nickel. As far as its physical properties are concerned, cobalt would no doubt be satisfactory as a substitute for nickel, and would have some advantages over the latter. Its wide commercial use will depend upon the cost of the metal and of the plating operation, the rapidity with which the work can be done, and the adherence of the deposit. The authors of the paper provide some interesting information on these points.

Where suitable plating solutions are used the deposits (on a variety of metals) are found to be firm, adherent, hard and uniform, and can be deposited at a much more rapid rate than is feasible with nickel.

Although wireless apparatus was not fully developed until 1909, it is estimated that over 6,000 lives have been saved by its use.

Baron Münchhausen's New Scientific Adventures

By Hugo Gernsback

Münchhausen On The Moon

BANG!!!
Bang! Bang! Bang!!!
Four terrible shots rang out.

A heart-rending moan—a piercing cry. Then a long, ominous silence.

BANG! BANG!!!

Two more shots more terrible than the first ones.

"Dick!! Dick!!!"

No answer.

"Oh, Dick!!! . . . . . ."

Less answer.

The pine trees on the cliff moaned plaintively in the otherwise oppressive silence. Suddenly a lone owl hoo-hood sharply and simultaneously a flash of lightning illuminated a scene of overpowering dread. I looked on aghast—my hair stood on end. I trembled violently, for what I had seen there was so terrible, so dreadful, so awful that it is impossible for a human being to describe it. For that reason I must refrain.

* * * *

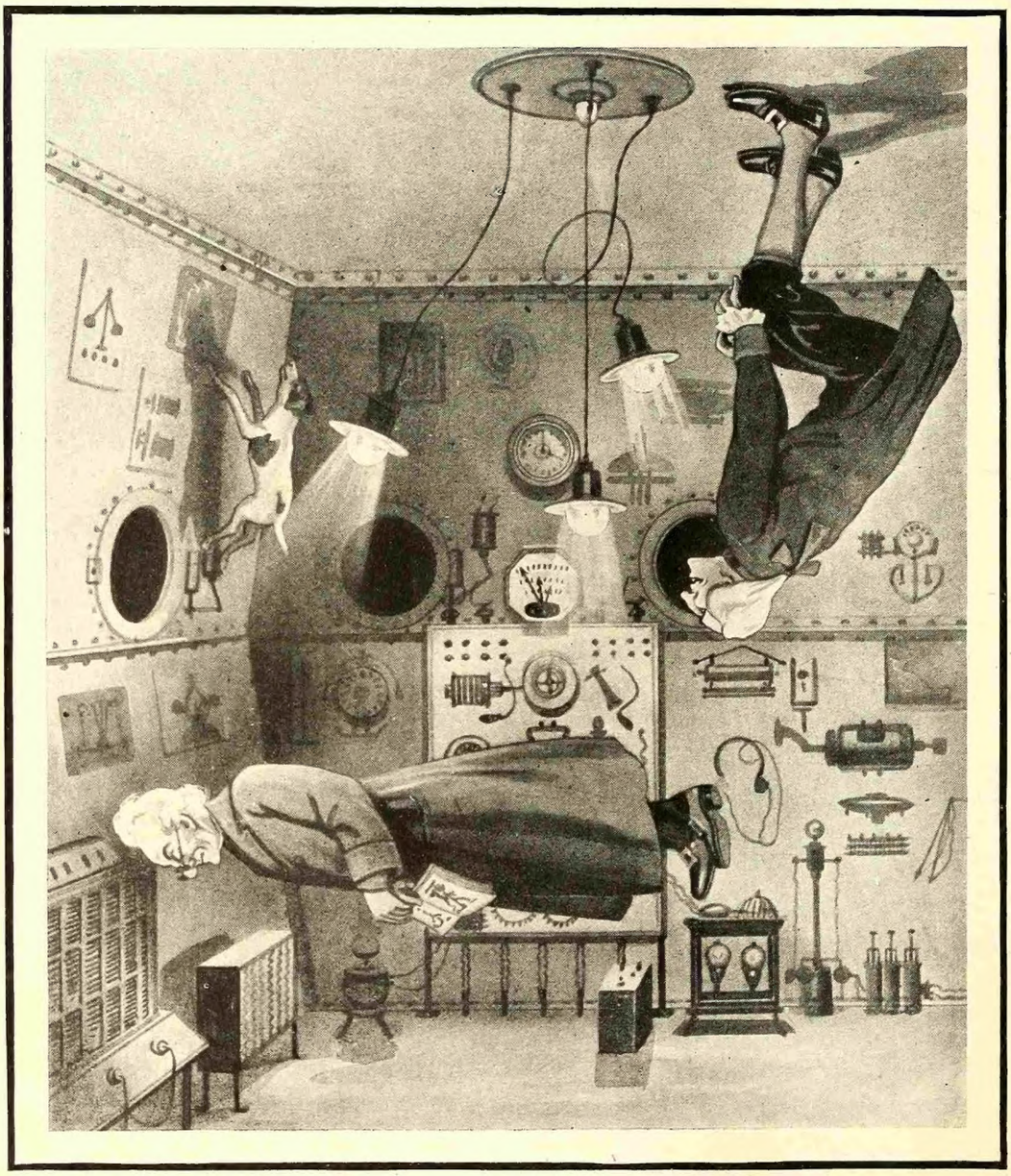
Now, honest, admit it. Was that not a good beginning? You can't deny that it grinned you. The trouble these days is that it is rather hard work to make people read stories. Most stories are not worth reading to begin with. You look at the heading and feel lukewarm. Then you read the first sentence and chances are you immediately form the opinion that the author is an insufferable bone head. At that, you may do him an injustice. He probably is only a second rate idiot. No matter, you won't read his stuff. That's where advertising pays. Put something real exciting at the beginning, even if it has no bearing at all on the rest of the story. Most anything goes, the more mysterious the better. Also—advice to authors whose rent comes due too frequently—the longer you draw it out the better. For the editor—unless he is an old crust and blue pencils most of it—will pay you real money for that dope unless, of course, his sense of humor has gone to smash entirely. Most editors' has.

(*Editorial Note.—We found it necessary to suppress 29 pages of Mr. Alier's manuscript here, as his remarks became entirely too personal and too caustic.—Editor.*)

Now it is a proven fact, supported by much evidence, that people in these days are fond of terminating things once started. Just so with a story. You begin reading a tale, no matter how painful, and once you have spent three minutes on it ninety-nine chances out of one hundred you will see it through to the end. It's like a good "ad." If once you are made to read the headline you probably will read the rest of it. It is the same with a story. Hence I beg your pardon for having taken an unfair advantage of you; in these times of fierce competition "us poor authors" must resort to unusual means, even if it is against all international laws. Just like the German submarine warfare.

Of course, I must admit that the plan has its defects. For with female women it don't work. You see they are foxy. You can't fool them that easy. For they have a cantankerous habit of reading the end of a story first! They laugh up their sleeves—if sleeves are in style that season—and the poor simp of an author who thinks he is going to spring a big surprise on them at the very end has another guess coming!!

So the smart author double-crosses you and puts the real end somewhere in the middle of the book. Then on the last page he arranges for a tearful parting of the hero and the heroine, intimating strongly that the two will never, *never* be married. That leaves you guessing. For if you haven't read the entire story how were you to know that they really got married in the end (in the middle of the book)? But the smart author simply tacked on a few chapters—after the end—showing that the heroine didn't like the hero's liver and that likewise the hero objected to the heroine's gall and to the scent of her face powder. So after things became unbearable they got a divorce—at the end of the book. That's what I call good construction of a story. But to get down to business.



... he remained suspended in midair without anything supporting him

After I had dusted myself off and had made certain that the various members of my anatomy were still on intimate terms with one another I limped off in the direction of my home. As I was not in a hurry I took my time about it. I chuckled inwardly for the good reason that on account of my various bruises I dared not chuckle outwardly; as with General Joffre in France—time worked for me.

But I get ahead of myself again and being too indolent to rewrite this paragraph and putting it ahead of the one above you will have to read it as I wrote it. If you don't approve of that I suggest that instead of reading the first paragraph *first*, to read it *after* the ones that follow this. That will simplify matters considerably.

The facts are briefly these: At the very beginning of this story I have told you how I had been of immeasurable benefit to the human race. I told you how as president of the "American Wireless Mouse-Trap Co." I had rid the country of mice and rats. I had told you how far-famed I was for being the first man to talk all around the globe with my historic wireless telephone. The name of I. M. Alier is linked with the greatest scientists of the world. For that reason I did not think myself immodest when I went to see Mayor Ezrah

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Coddlemaker, of Yankton, the town of my birth, with a simple suggestion.

There is a small triangular plot at the intersection of Main and High streets. It had come to my ears that a syndicate had been formed to purchase this plot from the city with the object of opening a combination hot frankfurter, flower and barber shop there. As the city would have to erect a monument to my honor sooner or later, and as the site was ideal for this purpose, I went to the City Hall and told the Mayor so. I thought I might as well arrange for the monument during my lifetime.

Mayor Coddlemaker, who had always been a staunch friend of mine, received me warmly. While I explained my mission to him, the color of his usual pink face changed to that of a fresh boiled lobster. Then it went over to a delicate shade of purple. I know now that his inner temperature must have risen from 100° in the shade to 150° in less than two minutes. I began to feel sorry for him that he had neglected to attach a safety valve to himself; it would have been decidedly useful just then. Fearing that His Honor was about to blow up the City Hall with his own person, I tendered him a glass of water. This, however, did not have the desired effect on him, but instead he took on four shades deeper of a beautiful purple and emptied the contents of the glass in my face. Most of it went down the neck of Coddlemaker's secretary, who was working with his back turned toward mine. While I wheeled around to apologize to the secretary, Mayor Coddlemaker, who is an ex-prizefighter, took me by the nap of my neck and spun me around like a top. This seemed to limber him up somewhat, and he became so delighted that he tried me out as a carpetsweeper, my face forming the business end of the sweeper. His Honor then amused himself for some minutes in playing ball with me. I obliged him by taking the part of the ball. My sense of humor being sadly deficient, I failed to see the joke after awhile. I told His Honor so between my rapid trips up to the ceiling and down into the Mayor's fists.

He bellowed something about him and the town of Yankton being made the center of derision with that fool "Münchhausen" story of mine. He playfully added that the papers poked fun at him day and night for letting me stay out of the lunatic asylum. He also mentioned that Yankton had become a permanent feature in all the comic supplements of the country, that on account of my hair-brained story I had definitely ruined not only his career, but the future of the town as well. He gleefully remarked that he had been itching to lay hands on me for a whole month and he thanked me profusely for having satisfied his itch! Whereupon he dumped me in his waste basket and while his secretary held the door open His Honor emptied the waste basket with a flourish. Without waiting to apologize I took a hasty departure.

Now comes the paragraph where I had dusted myself, etc., etc. See above.

On my way home I sympathized deeply with Mr. Galilei Galileo, of Pisa, Italy. He once took a fool notion in his head and told the world that the earth was not standing still, as popularly thought, but that it spun around like a top! Whereupon the world poked fun at him and his fellow citizens playfully intended to burn him at the stake. But Galileo was a good talker and an elegant advertiser. He kept telling them *E pur si muove,* also what an advantage it would be to have the earth spin around, because everybody would get a ride for nothing, and on the trip around people would see lots of new scenery in the universe. He also was careful to tell them that if the earth was to stand still, there would be no seasons any longer and, furthermore, one side of the globe would have a perpetual day and the other side a perpetual night. If by chance Italy should come on the dark side—well, good night!!

IS the moon really a dead and barren world as our scientists contend? The most powerful telescopes can only scan the moon's surface, but we know nothing of the interior.

The versatile Münchhausen has been doing some exploring and he tells us a few things, which somehow, sound plausible. Incidentally, do you know that you can jump thirty feet high without much effort on the moon? If you don't, this story will tell you all about it,—and a good deal more.

So they thought it best to let Galileo have his way and passed a resolution to let the earth spin around indefinitely.

Not that I want to compare myself with Galileo. Far be it from me. I only mention it to show how misguided the world is at times. It was so in Galileo's times and is so now. In years to come my story about Münchhausen will be believed, just as Galileo's preposterous idea that the earth moves is universally accepted to-day.

Just now I am a martyr to a just cause. In due time Yankton will erect that monument for me, or my name is not I. M. Alier.

* * * * * *

Whatever Münchhausen's shortcomings might be, he certainly is prompt. If I were his wife I probably would adore him, for he is always on time to the second. If there were a Mrs. Münchhausen I am sure she never would have to wait with the supper for him. He would be there on the dot, or he would have a mighty good excuse, and be it said here, Münchhausen does not make excuses as a rule.

My clock had just began striking the eleventh hour that evening when, true to his word, Münchhausen "called." There was the familiar, piercing screech in my 'phones, growing louder and louder, and in another second communication between Münchhausen's station on the moon and my own station in the sleepy old town of Yankton, Mass., was once more established.

"Good evening, my dear Alier," it came in clear, deep tones, in that sepulchral voice I had come to cherish, "are you ready for our nightly chat?"

"Indeed I am, Your Excellency," I made haste to reply, "how is your health this evening?"

"Perfect, perfect, my boy. Never felt better in my life. The air up here is so invigorating that I actually grow younger each day!"

"But I thought there was no air on the moon, my dear Baron. I am real anxious to have you tell me all about it."

"Of course, I will tell you, but let me see, where did I stop last night..... Oh, yes..... I believe my power gave out when I told you of my first impressions after the *'Interstellar'* left the earth behind."

The moon overhead was full and we could almost see it grow larger as we rushed toward it through space at an incredible speed. Professor Flitternix and I had calculated that we ought to traverse the 240,000 miles separating the moon from the earth in about 104 hours. This is an average of 2,300 miles an hour and may seem excessive, but in reality it is but a low speed, as speeds go in the universe. The calculation is very simple, too, and well known to astronomers.

Nothing very eventful happened during the trip to the moon. Flitternix was busy with astronomical observations, while I was engrossed with the machinery most of the time.

For the first hour after our departure from the earth we tried to become familiar with the many odd phenomena which presented themselves to us, due to the sudden, almost total, absence of gravity.

The *"Interstellar,"* no longer subject to the attraction of the earth, due to its gravity insulator, was only subject to the moon's gravitational attraction. But as we were some 200,000 miles distant from that body its comparative feeble attraction had but little effect on our bodies in the inside of our flyer.

For, according to the law of gravitation, our 1,000-ton flyer weighed but 110 lbs. at this distance from the moon.

Flitternix was the first to find this out. He had been pointing to the planet Mars with his hand stretched out toward one of the glass portholes overhead. While I looked at this beautiful planet I suddenly heard Flitternix exclaim. He was eying his arm in astonishment. It was still outstretched, but pointing slightly upwards; this is what happened:

On earth his arm would have fallen down to his side of its own accord by the action of gravity, the arm weighing, let us say, 10 to 12 lbs. Inside of the *"Interstellar,"* with practically no gravitation, *his arm weighed less than* 1-10 *ounce;* furthermore, our feet were still pointing toward the earth, where there was no gravitational attraction, due to our gravity insulator. The only attraction coming from the moon overhead, *his arm was pulled slightly upward* by a force of less than one ounce. To bring his arm in its normal position it was necessary for him to use his muscles, which he did with a foolish grin.

We then switched on the entire Marconium netting, thereby insulating us from the moon's attraction also. We were now no longer subjected to any outside gravitational attraction of any kind. Still the *"Interstellar,"* due to its momentum, continued to move forward in space with its original speed.

Some curious phenomenæ were now observed by us. The mass of the *"Interstellar"* being relatively small, its force of gravity was but very minute. When you consider that on earth this globe, with its volume of 600,000,000,000,000,000,000 tons,

attracts my body with 170 lbs. to its surface you will understand that the volume of the *"Interstellar,"* with its 1,000 tons, in accord with Newton's law can attract my body with but an infinitesimal fraction of a pound. *Therefore, practically speaking, all objects within our flyer were without weight.*

For a while we amused ourselves with odd experiments. Thus I would lift up Flitternix with my little finger and place him on my outstretched palm; he weighed less to me than if he had been a child's balloon. Buster, my terrier, became careless and started to jump around, with the result that he went clean up to the ceiling with a thump. His body being elastic he came down with the same speed as he had gone up. There was another thump and he went right back to the ceiling once more with undiminished speed. He simply could not stop any more. He was like a rubber ball bouncing up and down. There being no gravitational force to retard his speed, only the air in the room as well as the friction of his body against the ceiling and the floor; this acted as a slight brake to take up his energy expended originally. It was, however, so slight that after he had bounced back and forth some 200 times, howling frightfully all the while, we took pity on him and stopped him with our hands. After that he became very careful in his movements and we found it wise to imitate him.

We had to move about very cautiously and very slowly; any attempt to walk quick, for instance, was disastrous. Like Buster, it was exceedingly difficult to stop ourselves once started. We could, of course, walk on the ceiling or on the sides of the room with as equal facility as on the floor, for the reason that there is no "up" or "down" in free space. You could lay down most anywhere without danger of falling or even rolling. As our bodies had no weight, it mattered not where we lay down, either. Thus, stretching yourself out, with nothing but the sharp edge of a chair supporting your back, was as comfortable as laying on your cot. You see you weighed nothing, consequently your body could not press down hard on anything, and for that reason you could not possibly feel uncomfortable no matter how you rested.

The most delightful experiment, however, was when I took Flitternix and brought him to the center of the *"Interstellar"* while he was sleeping. Taking my hands away from him he remained, of course, where he was, i. e., suspended in midair without anything supporting him. There being no gravity he could not fall down nor up, for that matter. I then walked on the ceiling and called him. In a few seconds he woke up. I think he must have been the most surprised man in the universe just then. He began clawing the air and looked wildly about him; you see he thought he was still on earth and he imagined he was going to fall down! That goes to show how strong habits and instincts are. In a few seconds, however, he remembered where he was and "sat up." He certainly looked ludicrous sitting suspended there in midair begging me to pull him either up or down. I was so convulsed with laughter at his helplessness and the situation was so droll that I resolved to see the experiment through; for that reason I told him that I refused all assistance. By that time he had become interested in the situation himself and after thinking a little while he began jerking his body back and forward in the fashion of an acrobat on a swinging trapeze. This gave his body sufficient momentum and in a few seconds he had landed laughingly on the opposite wall."

I had listened to the Baron with amazement, but I knew that what he had said coincided with Newton's law of gravitation. There was, however, one point which I had revolved in my mind and which was not clear so I commented:

"What you have just related is certainly exceedingly interesting, my dear Baron, but there is one point I would like you to elucidate: How did you finally effect the landing on the moon?"

"Not so impatient, my dear, I was just coming to that. When at the end of the 100th hour we were but some 600 miles from the surface of the moon, which by this time had become so big that it filled up most of the sky overhead, we switched on the portion of the Marconium netting turned toward the moon. The other half of the netting, which heretofore had insulated us gravitationally from the earth, was then switched off. Now the earth began pulling us again and in a few minutes, with our momentum expended, we were going earthward once more.

Immediately we reversed the currents in the Marconium wire netting, with the result that we fell toward the moon again. In this manner, by manipulating the Marconium netting, I could vary the speed as well as the direction of the *"Interstellar"* at will and within a short while we were

SYNOPSIS

I. M. Alier, an eccentric young scientist of Yankton, Mass., who claims as his own many new as well as startling inventions, far ahead of anything as yet discovered, owns the largest radio-telephone plant in the country. One evening he hears strange noises over his phones and immediately a sepulchral voice is heard. It is Münchhausen, one of the greatest yarn and story tellers of all times. Münchhausen explains how it came about that he did not die in 1797, as popularly thought, and he furthermore gives unrefutable proof that his home is on the moon at present.

Alier wants to know why Münchhausen went to the Moon and how. The latter then explains how Prussia persecuted him and how he went over the the Allies and succeeded in capturing Berlin in a wonderful manner. However, it was not a complete success, so the Baron left Europe for America. He immediately constructs a machine which is to take him into space to the moon. Münchhausen has discovered how to neutralize Gravity by means of Electricity, and he applies this invention to his space flyer, the *"Interstellar."* The machine proves a success; it responds and is lifted with tremendous speed towards the moon.

THIS STORY STARTED IN THE MAY ISSUE. BACK NUMBERS WILL BE SUPPLIED AT 10c. EACH POSTPAID.

but a few miles distant from the moon's surface. We carefully scanned its rugged face with our glasses and we finally decided to make our landing in the plain known to astronomers as *Mare Nubium.* This plain, which in past aeons undoubtedly was part of an ocean, but now devoid of all water, measures several hundred miles across and in some sections it has a very level appearance; moreover it looked sandy like a desert through our telescopes and we decided that we could probably make a successful landing there.

By carefully manipulating the switches controlling the Marconium wires the *"Interstellar's"* wide landing belt finally rolled gently over the volcanic sand of the moon and the flyer came to a dead stop 102 hours after leaving the earth.

It was a supreme moment. We were the first humans to land on the moon and we were naturally quite overcome with emotion for some time. Had I not been the first to conquer space and break away from the earth? Was I not the Columbus of a new world, a world far greater than any explorer ever discovered? Had I not opened the door of the universe that had been locked to all mortals since the beginning of our little world? Had I not thrown off the fetters which chained humanity to its poor, sordid planet for aeons?

I think I had a right to feel elated.

However, hard work lay before us. For centuries it had been the conviction of scientists that the moon was a dead world, devoid of any atmosphere, water and vegetation. Of course, in the absence of these three necessities life could not exist. This we realized only too well, but at best the earth's scientists had no absolute proofs; after all, their conclusions were but theories, although very plausible as well as convincing theories.

Knowing all this we proceeded very carefully. The first test we made was naturally to ascertain if there was any atmosphere on the moon. This test was very simple. We opened a small stopcock leading to the outside and we then listened with strained ears. We had tried the stopcock test out in space midway between the earth and the moon and the air had been drawn out with a loud hiss. While we were listening now there was no hiss, but we could feel the air being drawn out strongly from the *"Interstellar"* when placing the finger on the opening of the stopcock.

From this we concluded that there must be some kind of an atmosphere on the moon, although probably a very rarefied one. This relieved our anxiety immensely and I suggested at once to test the lunar air on Professor Flitternix's canary bird, Pee-Pix.

This was met with violent opposition by Flitternix, who made the counter-suggestion to try it on the dog first, the dog being Buster, my fox terrier. This suggestion was not met with wild enthusiasm by myself either, and a deadlock followed. Finally, however, we drews lots and I lost. Buster therefore was the first terrestrial being to inhale the lunar atmosphere.

With a heavy heart we placed him into the ejector and closed the door behind him; he was now in the air lock. By moving two levers the outside door of the ejector was opened and Buster was in the moon's atmosphere. In another second he had hopped to the ground, anxiously watched by us through the glass plate portholes.

We saw him sniffing at first, whereupon he began coughing violently for some minutes. After that he seemed to become quieter and he commenced to walk around in a curious, excited manner, as if under the influence of a drug.

We could not understand this, but continued watching him with concern. Within an hour, however, he seemed to have become acclimatized and he behaved normally.

I reasoned that if Buster could stand it we could, and I said so to Flitternix. The professor was of the same opinion and we decided to risk it. We opened the door carefully, leading to the outside, drew a deep breath and stepped out. In another second we had landed on the moon.

The first sensation was a strong ringing in our ears and the curious sense of lightness of our bodies. The latter sensation, however, was not new to us, as we had experienced it already in the *"Interstellar,"* due to the absence of gravitation. We now took a careful breath and started to cough violently at once. Nor could we stop it at once. The "air" which we inhaled

(*Continued on page* 122.)

Electricity Helps to Heal German Soldiers Wounds

THE photograph shows a number of wounded German soldiers under expert treatment in a hospital for the wounded. As will be seen, some of the soldiers have their arms inserted in an electric heating oven, and it has been found that this heat treatment acts very remarkably to remove stiffness from the joints and muscles.

The temperature of these ovens is very carefully watched by means of the thermometers, and the soldiers receive this treatment at regular periods each day until they are thoroughly well and ready for the front again.

The electric ovens shown have been used considerably in hospitals and sanitariums with great success. They comprise an electrical heating element composed of a wire or ribbon resistor, which becomes heated to different degrees when the electric current is applied, depending upon how the different sections of the heating element are connected to the line wires.

As seen, each heater has a marble switchboard on same which contains the different switches for adjusting the amount of current used, and which, in turn, permits any degree of heat wanted to be had readily.

Some of the electrical ovens for this purpose are much larger than the ones here illustrated and are adapted for heating the entire leg, etc. Also some of the ovens are built in such a shape that the abdomen or back of the patient can be heated as well.

Photo (C) by Underwood & Underwood.

The Kaiser's Wounded Soldiers Make Use of Electric Ovens to Limber Up Their Stiffened Muscles.

LOCATING SHELL FRAGMENTS IN WOUNDS.

A method of localizing shell fragments or other pieces of magnetic material in the human body, which has recently been tested in France, is noted in the *Engineer*.

A powerful alternating current electromagnet is brought near the region affected, and the presence of a magnetic body within the flesh is indicated by a perceptible trembling of the surface at the immediate locality. By feeling the flesh the surgeon can easily find the spot where the trembling is strongest, and can thus locate the fragment of projectile with considerable accuracy.

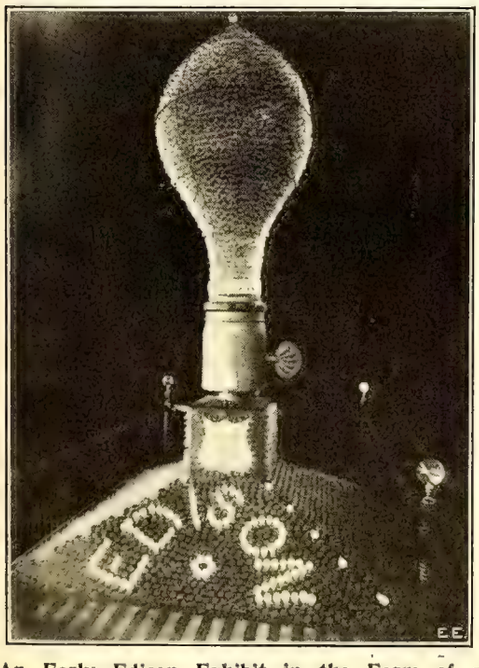
The action of this alternating current method of locating pieces of iron or steel which may become buried in the flesh, is based upon electromagnetic induction set up in the iron particles or fragments, due to the powerful alternating magnetic field of flux created by the A.C. magnet.

The pieces of iron thus manifest magnetic qualities, owing to the current set up by induction in them and, of course, will also manifest movement, the same as the action taking place in an A.C. motor, etc.

Other methods in use consist of the X-Ray, the Induction Balance, etc.

ELECTRIC BULB COMPOSED OF 16,000 LAMPS.

A huge electric lamp, herewith shown, was built for the Cincinnati Exposition in 1888. This lamp consisted of a form or frame made of wire and having 16,000 electric lamps fastened on it. The "filament" consisted of a 3-inch pipe bent in the form of a regular filament, and red electric lamps were built upon it. When the red lamps were lighted their rays penetrated the glass of the outer electric bulbs and gave the appearance of a *real* gigantic lamp. This photograph is from the wonderful collection of William J. Hammer, the eminent electrical engineer and for many years the associate of Thomas A. Edison in the development of the incandescent lamp.



An Early Edison Exhibit in the Form of a Monster Lamp Bulb Containing 16,000 Regular Size Bulbs.

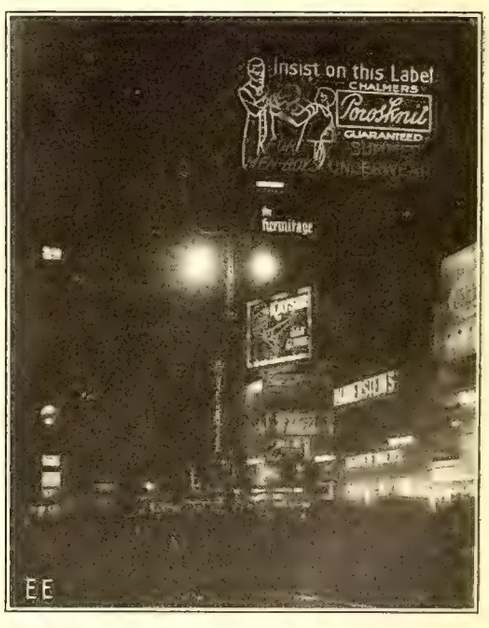
SELF-INDUCTION OF SOLENOIDS OF APPRECIABLE WINDING DEPTH.

At the April 23 meeting at the Imperial College of Science, London, a paper by S. Butterworth was read having the above title.

The existing formulæ for coils of this type, viz., those of Rosa and Cohen, of the U. S. Bureau of Standards, Washington, D. C., are shown to be inaccurate, the error amounting to one-fifth of 1 per cent. for the best formula when the winding depth is one-tenth the diameter of the coil. For greater winding depths the error is larger. The inaccuracy in Rosa's formula is due to the neglect of curvature in correcting for thickness, while in Cohen's formula the error is due to the approximate method of development. New formulæ are developed by methods which are free from such approximations, and which apply to any coil for which the length is greater than twice the diameter, and the winding depth is less than one-tenth the diameter. These formulæ are capable of giving eight-figure accuracy. Simplified formulæ are also given which are suitable when only four-figure accuracy is required.—*The Electrican*, London.

NOVEL "BOXING BOYS" ELECTRIC SIGN.

A spectacular electric sign, having rapid action to hold the attention of the public, is shown in the illustration herewith. This sign is one of the many marvelous attractions along the "Gay White Way" of New York City.



Electric Sign in New York City Featuring the "Boxing Boys" of Porosknit Fame.

THE FRIAR'S ELECTRIC LANTERN.

A new electric lantern herewith illustrated was recently put on the market. The lantern has the shape of an old-style oil lamp in which the oil fuel has been substituted by the modern dry battery, thus

Neat Electric Battery Lamp Known as the "Friar's" Lantern.

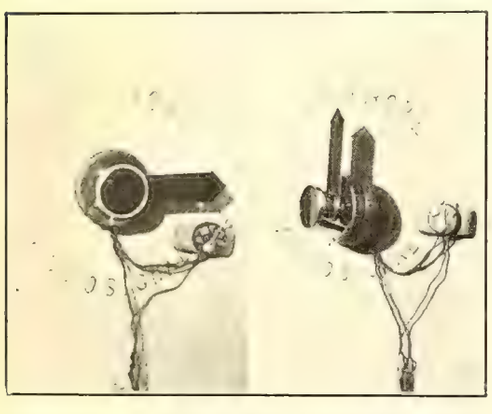
eliminating the accompanying dirt and danger occasioned by the use of oil.

The battery of this lantern is guaranteed by the manufacturer to give five hours continuous and 10 hours intermittent service, and while the fuel is not quite as cheap as in the old-style oil lantern the compensating features of neatness and safety in the new Friar's lantern make the difference in cost well worth while. A handy switch on the base enables the user to turn the light on or off.

A telephone call is ordinarily answered to-day in from three to five seconds. In the first exchanges it required from two to three minutes, and often a great deal longer. Such service would stagnate the present business world.

ELECTRIC SIGNAL FOR AUTOMOBILES.

An electrical signal to show the direction in which an automobile is to turn at street corners has been invented by a California man. An arrow-like indicator arm, rotatable from a normal vertical position to either right or left and operated by electromagnetic control, indicates the direction to those in the rear that the vehicle is about to veer off in. An electric lamp at the hilt of the reflector blade adds to the usefulness of the device at night.

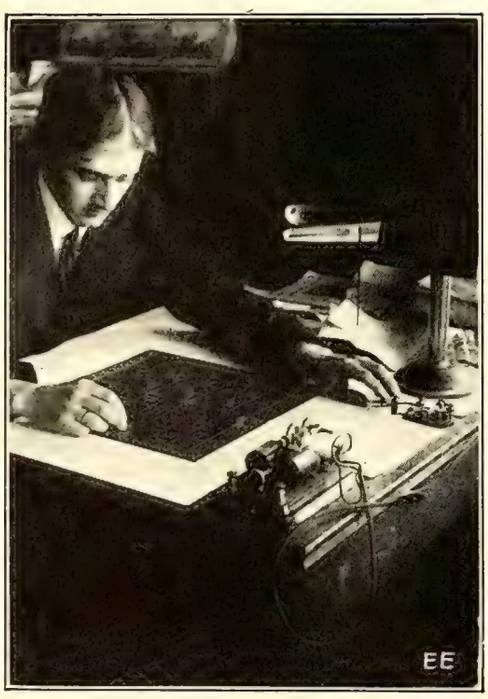


Two Views of New Electric Automobile Signal.

PLAYING CHECKERS BY TELEGRAPH.

Exciting checker games by telegraph are not uncommon, and after the heavy work in the depots of many Western railroads has been transacted and the weary night operators return to their rooms to report the train either departed or passing by, the sounders click off mysterious numbers, which recently have been solved as checker tournaments by wire, the contestants being telegraphers located many miles apart. Many times checker games are in action over entire railroad divisions.

The accompanying photograph shows the operator putting the telegraph to good advantage in a very exciting game. The system used is very simple. An ordinary checker-board is marked from 1 to 32, inclusive. Two sets of checkers are used by each operator. At the start of the game the operators decide on who is first to move. The first mover clicks off in the Morse code as follows: "14 to 19, or 13 to 18," or vice versa, or according to the side of the board he chooses. Usually the operators decide in advance whether they have selected the red or black. When a king is made it is flashed over the wire, and although the contestants are far apart,



Playing Checkers by Telegraph.

yet the game is as interesting as if they were seated opposite each other at the same table. Frequently other operators along the line put their boards in action and *watch the game* by following the numbers as they come over the wire, moving the checkers on their boards accordingly. The operators say it is a great pastime.

TIFFIN RADIO CLUB.

A new radio organization was organized recently in Tiffin, O., with five charter members and has great promise of rapidly enlarging its membership.

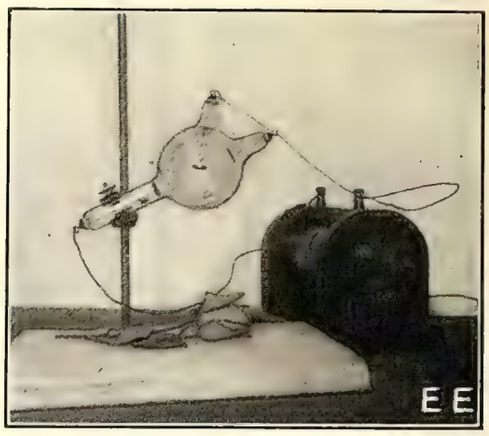
The officers elected are: President, John Grossman; vice-president, Paul Frederick; secretary and treasurer, Harold Buck.

It is desired that all wireless experimenters living within communicating range of this club correspond with the secretary in order to widen the influence and activities of the organization.

Black asphaltum is excellent for painting wireless instruments on account of its good insulating qualities.

THE STUDY OF FLOWERS WITH THE AID OF X-RAYS.

The applications of the X-rays to the study of phenomena invisible without their aid continually increase in number. One of the latest scientific uses found for these rays is in studying the inner structure of flowers and fruit buds. In some respects this is a better method than dissecting for



Studying Flower Growth and Structure by Means of the X-Ray.

the study of certain parts of plants, especially while growing.

The photograph here shown is that of a rose being examined by the aid of X-rays which are produced by the X-ray tube placed above and connected to a high-tension induction coil. The flower is placed on a box, which may be a plate-holder, containing the photographic plate.

Although most electric motors contain iron cores in their magnets some motors do not have any iron in them, as those, for instance, used in recording watt-hour meters.

It is now possible to transmit and receive eight distinct telegraph messages over a common circuit of two wires.

A FLASHLIGHT FOR THE PENCIL.

While there have been many novel applications made recently of the electric flashlight, probably one of the most useful for literary people, such as reporters, etc., is that shown in the illustration, and embodying a complete miniature electric flashlight with battery, adaptable to a pencil.

A simple switch on same enables the user to utilize the light whenever desired. This device is extremely small indeed and can be carried in the pencil pocket without any

This Ideal Pencil for Reporters Carries a Small Electric Light of Its Own.

undue bulging. One battery will last a few months with ordinary use. Such a pencil light is just the thing for taking down notes in theaters, where the auditorium is darkened; besides, it has many other useful applications.

LUMBERING TELEPHONE SIGNAL SERVICE.

By Frank C. Perkins.

The accompanying illustrations, Figs. 1 and 2, show the telephone refinement of the signaling systems used by lumber producers employing the long haul or pull boat method of skidding. This is said to be the quickest and only positive mode of signaling between drum man and tong man, and it is pointed out that instantaneous and accurate signals by telephone assure increased efficiency and decreased expenses.

It may be stated that every large lumber producer in the country, especially those using the out-haul system of logging, either the ground or cableway skidders, has been sorely pressed for an efficient method of signaling, which would be both positive and instantaneous, between the tong man in the woods and the drum man on the skidder. Every conceivable way has been tried, as, for example, the whistle signal, in which a string or cord is dragged out into the woods and is pulled to blow the whistle on the skidder. This has also been tried with a bell instead of a whistle.

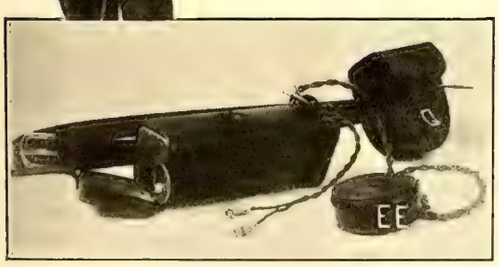
Railroad signals were experimented with and, last of all, hollering was tried. This was done by placing a signal man or flag man near the tong hookers, who could signal to a man located near the engine, who in turn would signal the engineman. After numerous trials, each was thrown aside as useless. Still, some companies are doing the best they can by combining the railroad and the hollering signals, but these are far from satisfactory. Some companies have even given up the out-haul idea, on account of the lack of proper signaling apparatus. Every lumberman knows just how slow and inaccurate these modes of signaling are, especially where the out-haul skidder is in use.

There has now been designed special telephone instruments which have solved the problem of signaling for the lumberman. By means of this system the tong man and drum man can talk to each other at all times, regardless of whether the skidder engine is running or not, and it works successfully whether the tong man be 100 feet or 4,000 feet from the skidder.

The telephone service consists of a steel reel or drum, placed or mounted on the skidder, together with the instruments. On the drum are 2,000 to 4,000 feet of strong

At Left: Fig. 2. Lumberman Using New Type Telephone Especially Designed for the Purpose.

Below: Fig. 1. Lumberman's Type Telephone Recently Put on the Market.



heavily insulated wire made for this purpose. There is continuous connection at all times through this wire by means of a brass commutator.

The head telephone set is connected by a plug and jack, and can be disconnected instantly. This set is very light and leather-covered to protect it from steam, grease and sparks, and is never in the way of the drum man when running the engine, and allows him to have both hands free. No batteries are used with either set, so the cost of maintenance is practically nothing. They work on the permanent magnet system. Either party can call. Should the tong man desire to talk to the drum man while this plug is out, he can be signaled by pushing the button and turning the crank on the field set, which will ring a bell inside the skidder set, notifying the drum man that he is wanted. He can then plug in and talk.

ELECTRICAL NOVELTIES FOR THE BANQUET TABLE.

By Felix J. Koch.

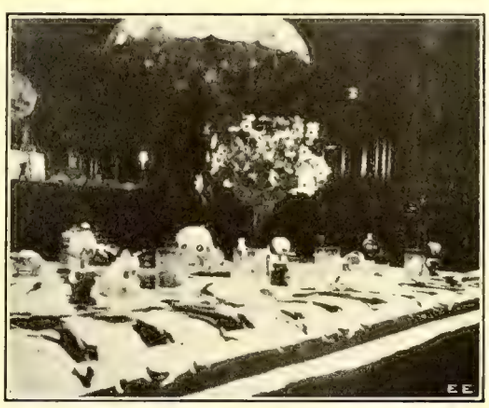
Down Cincinnati way hostesses *do* seem to possess the knack of getting up novelties—things that will appeal and yet which are different from anything anyone may have seen, just exactly the same theretofore.

So not long since, when young Jack Roosa was to celebrate his graduation from the medical college at the Queen City—and this with a banquet to his friends—his big sister, to whom he left arrangements, conspired with the toy dealers and the electricians of the town, with results as shown in the picture.

Up at the table center there was a great bowl of cosmus—just a plain vase, it seemed—and you never would guess that the base of that vase was an inverted bowl, or cave, within which a central plug could be placed for wires radiating out from between the grooves of the design on the vase. Five minutes' survey of the cheapest vases in any china store will supply you with such, of course.

These little electric wires—neatly insulated with green, that could be concealed beneath the flattened ferns on the cloth or among the lines of smilax—led, each in turn, to an inexpensive skull of papier-mache, supplied by the toy store, and there lit up a wee little bulb light, alternate red, then deep green.

These skulls in their turn were placed



Electrically Lighted Skulls, Figures, etc., Make a Novel Banquet Table Display.

upon paper napkins of Hallowe'en patterning—witches, dark nights, Jack o' lanterns—likewise from the toy store. Otherwise, ferns and smilax, a carnation for boutonniere at each place, and the table was done.

When ready for serving, all lights save those in the wee skulls were extinguished. The little lamps cast their subdued rays through the hollow eyes on the place-cards beneath; and by aid of these, and these only, the young "medicos" found their places and enjoyed their first course—the initial one of a season of revel and fun. The picture shows the table ready for the guests.

A NEW ELECTRIC DISHWASHER.

A new electric dishwasher has recently been placed on the market.

Fig. 1 shows the dishwasher permanently connected in a kitchen. On the shelf at the left a rack of dishes is seen ready for washing. At the right a basket is shown in which glasses and silverware are placed.

In Fig. 2 the interior of the machine is shown with the rack of dishes and the basket containing the glasses and silverware in position.

Fig. 1. Electric Dishwasher Installed in Modern Kitchen.

Beneath the circular tank a ¼-horsepower electric motor is direct-connected to a small centrifugal pump, which forces hot soapy water through a perforated pipe in the center of the machine and out over the dishes until they are perfectly clean.

The dishes in the machine being above the water level and in a vertical position, the water drains off, while the combined heat from the direct contact with the hot water and the contained heat in the tank dries the dishes.

During the entire operation of washing, rinsing and drying, which takes less than five minutes, the dishes remain stationary in the machine, thus eliminating any danger of breaking or chipping.

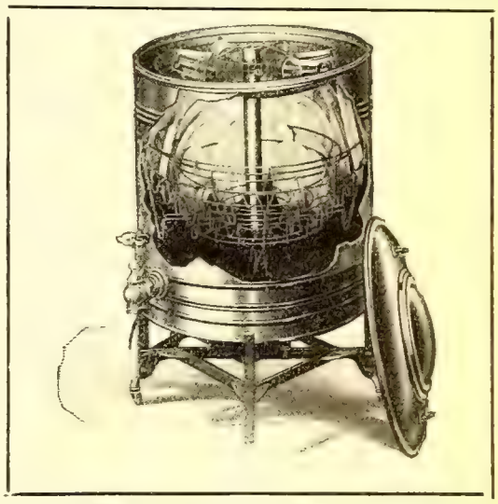


Fig. 2. Showing Dishes Placed in Electric Dishwasher.

AN "ATTRACTIVE" OLD MAN.

Different from the immortal "man with a hoe" is the man pictured in the illustration, who is kept busy walking around the yards of the Willys-Overland Co. at Toledo, O. By means of his trusty steel magnet secured to a shovel handle he man-

"The Man With a Magnet" Picks Up All the Nails, etc., in a Western Auto Plant's Yard.

ages to keep the roads about the auto plant clear of small iron or steel fragments which might puncture the auto tires. The magnet picks up all the nails, chips, etc., and which are then removed from the magnet and deposited in the pail.

HOW TO PRESERVE YOUR ELECTRICAL EXPERIMENTER.

No doubt many subscribers to *The Electrical Experimenter* keep the back numbers for future reference for the purpose of constructing instruments described in them, etc. Frequent handling while looking up the desired information soon renders the magazines ragged and worn.

To prevent this, get some manila paper folders, such as are used for music, and place the magazines in them. One or more copies may be put in each folder, as desired. Mark each folder so that you can see which copy or copies are enclosed. Then arrange the folders in the order in which the magazines were published.

This method, in connection with a card index, saves considerable time in hunting up any instrument or apparatus described in any issue, at the same time preserving them. Contributed by

WILLIAM H. SCHMOLL.

Dry cells should never be connected up with accumulators; the effect of the arrangement might be expected at first to light the lamps to an unusual brilliancy. Very quickly, however, the dry cells will become exhausted and then they will act as a dead resistance to the passage of current from the storage battery to the lamp.

A PHONOGRAPH-TELEPHONIC LECTURER.

An exceedingly ingenious phonograph-telephonic lecture system has made possible a wonderful reproduction of the Panama Canal at the Panama-Pacific International Exposition. This remarkable replica of the canal gives the visitor a more intimate perspective of the entire Canal Zone than is perhaps possible by a trip through the canal itself. This canal, in miniature, covers an area of four and one-half acres, and is accurately and minutely made to the smallest detail.

In order to facilitate the inspection of this gigantic model, an endless moving platform circumnavigates it. The platform is 1,147 feet long and consists of 144 cars, which are propelled by electric motors. Each car is equipped with seats for the passengers, and each seat is equipped with a pair of *Western Electric* watch case 'phones attached to an adjustable handle, through which one can hear a continuous descriptive lecture as the trip is made around the canal model. Fig 1 shows the type of 'phones used. This special type of handle was designed so that the spectators would not be obliged to hold their arms in an uncomfortable and tiresome position, and to prevent the necessity of removal of hats on the part of the ladies. Fig. 2 shows the telephone equipment installed on one of the passenger seats.

A telephone transmitter is connected to an Edison phonograph, which contains the lecture and reproduces it into the transmitter. This transmitter is connected to 42 receivers, and thus 42 passengers are connected with one phonograph. There are four of these units in the system.

This is the modern way of lecturing.

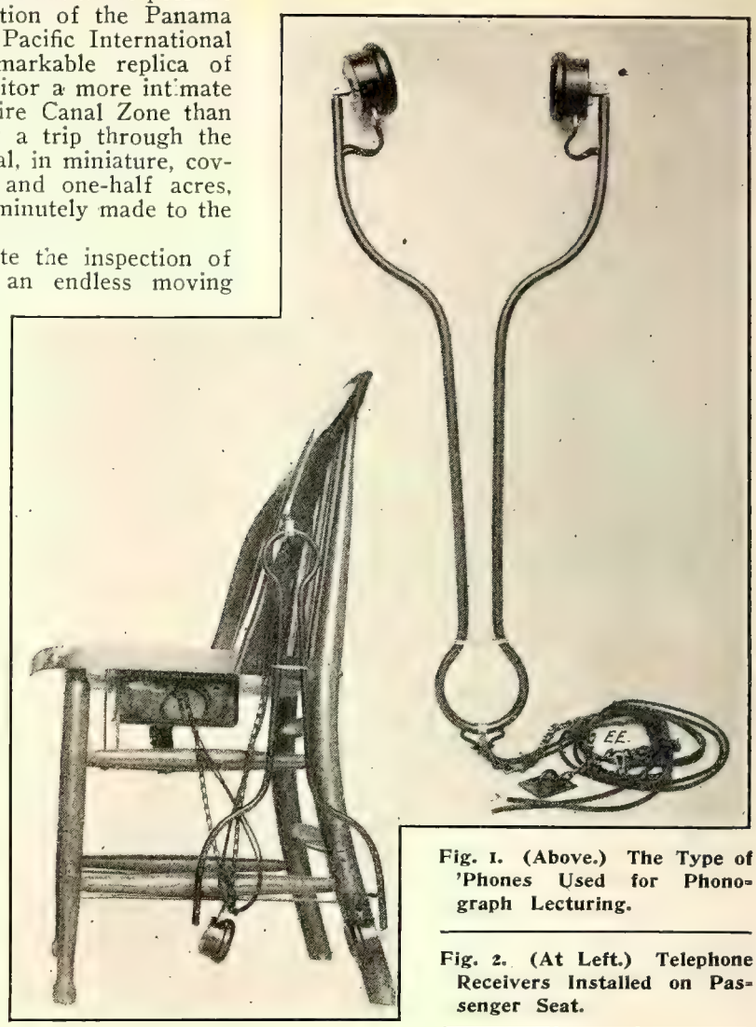
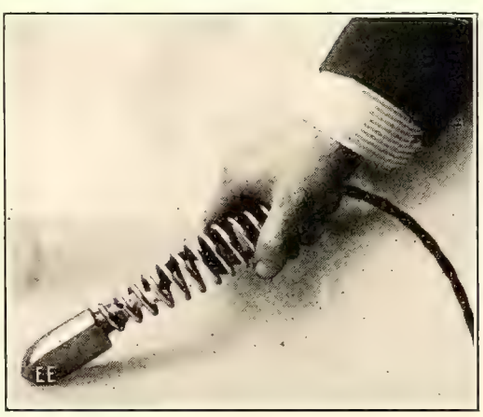


Fig. 1. (Above.) The Type of 'Phones Used for Phonograph Lecturing.

Fig. 2. (At Left.) Telephone Receivers Installed on Passenger Seat.

AN ELECTRICALLY HEATED SHOE-TREEING IRON.

The electrically operated shoe-treeing iron or "Calorel" re-laster, as it is called, which is illustrated herewith, is designed for use in retail shoe stores and can be operated from an ordinary lighting socket. It consists of three parts rigidly fastened together—the highly polished brass tip, the heating element, and the handle, which is of nickeled-steel wire. The brass tip weighs 1 pound and is able to store a comparatively large amount of heat. The device is equipped with 10 feet of flexible cord and a detachable plug, and takes 80 watts. At the average price for electric current it can be operated for less than half a cent per hour. It should be of great service to all shoe dealers in aiding them to make shoes look and fit their best.



A Flexible Electrically Heated Re-Laster for Shoes.

TO DISTINGUISH DIRECT FROM ALTERNATING CURRENT.

In case of uncertainty the following very simple method may be used to ascertain whether an electric lamp is supplied by direct or alternating current. Stand at some distance from the lamp and wave a stick to and fro between it and the observer's eye. If the current is direct (continuous) no distinct image of the stick will be seen, but only a blur. But if the current is alternating there will appear to be a number of sticks. This is due to the fact that an alternating current reaches a maximum and falls to zero in very rapid succession. A similar effect may be observed in a darkened room if an induction coil with bright sparks passing between the terminals is substituted for the lamp.

The energy freed by cooling one spoonful of water one degree would operate a telephone for ten thousand years. This baby current of electricity must take a voice 3,400 miles, and it cannot be increased or its power to transmit speech is gone.

LOCATING BURIED PIPES ELECTRICALLY.

Where will we strike an underground pipe? The haphazard plan of drilling and chopping the soil has never been satisfactory, and some means of determining the presence of underground pipes before boring into the soil have been sought ever since underground pipes have been in general use.

An apparatus which will determine the exact location of metal pipes, conduits, cables, etc., that are 12 feet or less underground is shown in Fig. 1.

The apparatus consists of an induction coil delivering a medium voltage, batteries, telephone receiver and an exploring or feeling coil.

The apparatus is used as follows: Terminals of the instrument are attached to a pipe at some accessible point. Then the operator holds the exploring coil in his hand as shown in Fig. 2, and holds the receiver to his ear. He now walks about, holding the exploring coil near the ground. The vibrator is then started on the coil. The humming of the vibrator is heard in the receiver, but as soon as the operator comes anywhere within the area enclosed by any pipes the humming in the receiver will decrease, and over the pipe no hum at all will be heard. The operator then knows that the pipe is within this area where he stands.

Fig. 2. Proper Method of Handling Exploring Coil When Tracing Path of Pipe.

The whole device is portable and can be carried about readily. It operates on batteries and sells at a reasonable price.

Fig. 1. Electrically Operated Inductive Type Buried Pipe Finder.

Russell Hoffman, of New Lexington, Ohio, writes us:

"I received my first issue of *'The Electrical Experimenter'* and think it is the best magazine I ever read."

A. S. Burleigh, of Great Falls, Mont., writes us as follows:

"*The Electrical Experimenter* has sure been worth 50 cents during the past year."

Tungsten lamps give about three times as much light for same current cost as carbon lamps.

Liquid air boils water and burns violently when ignited by a match.

THE SUN, THE BASE OF ALL ENERGY.

In this age of scientific wonders, we are perhaps, at times, apt to forget where the base of all energy in various forms is located. This central dynamo, if so we may term it, is the Sun, which is constantly giving off energy in the form of very rapid heat waves, transmitted through the medium we now call the ether. The ether transmits light, heat, wireless and other waves by vibration according to the theories now accepted, and when a body intercepts these waves they manifest themselves in one form or other.

Says D. Albert Kreider, Ph.D., of Yale University: "All heat, natural or artificial, is traceable to the sun as the original source. By the ancients the sun was regarded as a huge ball of fire.

When one remembers what a small speck in the universe the earth is, and how far it is from the sun, it will be evident that the earth can intercept only an infinitely small portion of the total heat which the sun radiates. Nevertheless, at the earth's surface this is at the rate of about 7,000 horse power per acre! How then can such an enormous loss of heat by the sun, without cooling, be accounted for?

The answer is that the sun is constantly contracting.

Anyone who has ever pumped up a bicycle tire knows that the compressing of a gas, heats it. Now the sun is still gaseous and is compressed by its own enormous force of gravitation. This force is 27.5 times as great as that of the earth. To illustrate: a person whose weight here is 110 pounds, at the surface of the sun, would weigh 1½ tons. But the sun can contract only as it loses heat; and thus it provides a nice balance of forces which maintains the temperature. Obviously this contraction can not go on indefinitely. It has, however, gone on for hundreds of millions of years in the past and may continue for millions of years to come.

The sun is an enormous mass, 866,500 miles in diameter, which is 109½ times the diameter of the earth. Calculation has shown that a contraction of only 250 feet per year is sufficient to account for all of the heat energy which it radiates. At this rate the contraction could continue for 9,000 years before the most powerful telescope could detect the consequent change in its diameter. It must be remembered that the earth is 93,000,000 miles from the sun.

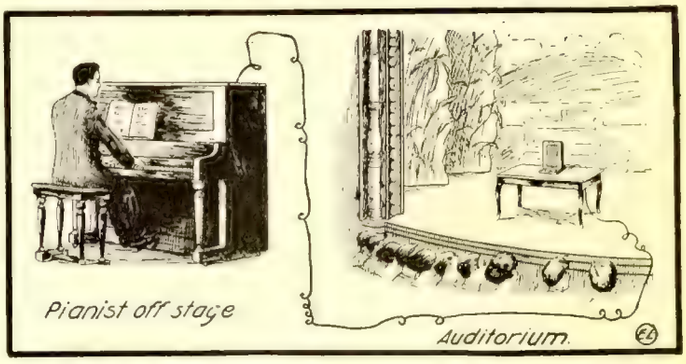
FINAL CALL

Beginning with July 1st the subscription price of THE ELECTRICAL EXPERIMENTER goes to $1.00. *It is to your interest to subscribe now while the price is so low.*

THE ELECTRICAL EXPERIMENTER is the greatest value today in Electrical Literature. If you intend to subscribe to it, do it now. One year, 50 *cents;* 2 *years for* $1.00, 3 *years for* $1.50. 5 *YEARS for* **$2.00.** (*Foreign postage to be added.*)

THE MACROPHONE OR LOUD SPEAKING TELEPHONE.

Loud talking telephones are always in great demand for various purposes, one use for them being illustrated in the sketch here presented, where piano music is transmitted electrically over a wire to a theater, or *vice versa*, etc.



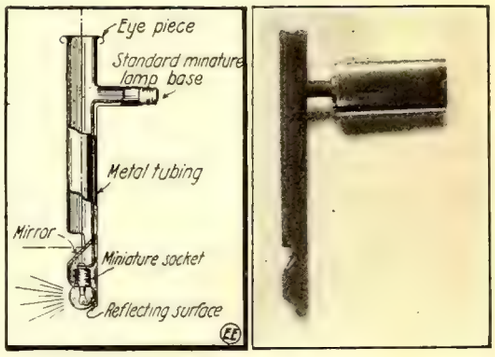
Loud Talking Telephonic Device Adapted to Piano Recitals, Etc.

The Macrophone loud speaking telephone is a radical departure from the usual form of such apparatus, as the diaphragm is composed of a thin wooden panel suitably supported in an acoustic sense. This wooden membrane is caused to vibrate and sets up sound waves by a powerful set of electromagnets acting on a lever secured to it. The lever is given resiliency by means of a strong rubber band, and thus no rigid connection exists between the diaphragm proper and its actuating magnets.

This loud speaker will transmit regular speech, music, phonograph sound, etc., and operates on eight dry cells, which will last for a period of three to four months. A microphone is generally used in the circuit, but for piano music transmission, such as shown here, the wooden diaphragm is rigidly connected to the piano sounding board by a wood pin glued between them. The Macrophone acts as transmitter or receiver.

AN ELECTRICAL INSPECTOSCOPE

A handy and neat instrument for inspectors, automobilists, engineers, machinists and others is the Crane inspectoscope, illustrated by the half-tone and detail sketch.

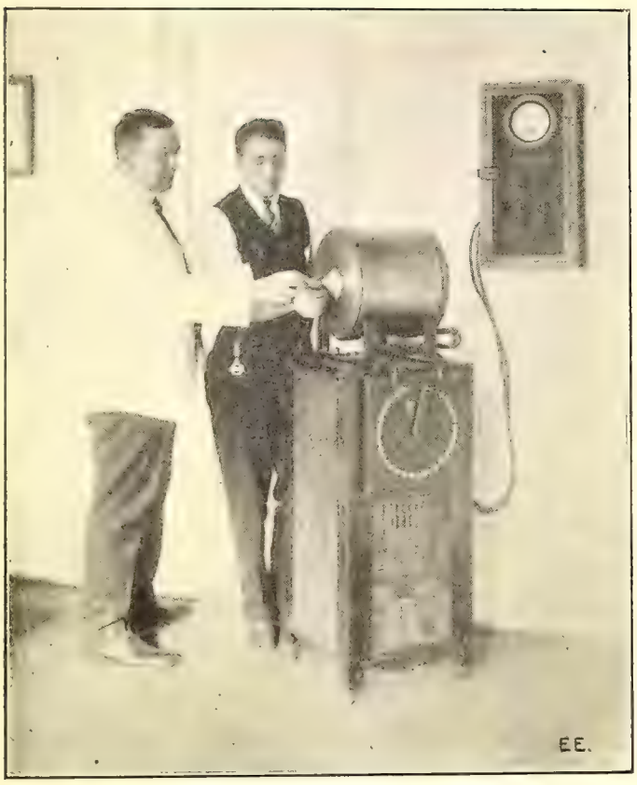


Sectional View and External Appearance of the "Inspectoscope," Useful for Looking Around Corners With.

It works on the principle of optical reflection, and, as the details indicate, use is made of a small flashlight lamp placed at the base of the tube. Hence in dark corners the lamp, which is lighted by screwing the attachment plug into any flashlight case, illuminates the object, and its image is viewed by placing the eye against the eyepiece at the top of the tube. The device is small in size and carried readily in the coat pocket. It is extremely useful in locating oil and carbon deposits in gas engine cylinders, small parts, screws carelessly dropped into some intricate machine, wires being 'fished" under flooring or in walls.

POWERFUL MAGNET DRAWS STEEL FROM BODY.

The removal of pieces of shrapnel, steel-jacketed bullets, steel shavings, etc., by the use of powerful electromagnets in hospitals abroad has been acclaimed by many newspapers as the very latest application of science to surgery. It is interesting to note that the Westinghouse Electric & Mfg. Co. has installed in the relief department of its East Pittsburgh Works a magnet for removing metal imbedded in the flesh, which is one of the most powerful in the world.



Powerful Electromagnet Draws Iron or Steel Chips From Fingers, Eyes, Etc.

The magnet is mounted on a box containing the resister, which is used to regulate the amount of current flowing through the coils. It requires 4,000 watts for its operation, or enough power to supply 100-32 C. P. Mazda lamps.

It is not an infrequent occurrence for steel and iron workers to get bits of metal in their eyes or hands. Previous to the installation of a magnet the only means of removal was by probing, a method which is as uncertain as it is painful. Since this electromagnet was put in operation it is a very simple proceeding to extract such particles. The portion of the body in which the foreign particle is embedded is placed near the pole tip of the magnet, the switch closed, and the magnet does the rest. The pole is removable, a number of different shapes being supplied for various classes of work.

It is very common for flying bits of metal to lodge in the eye. Should they strike with force enough to become imbedded the removal, without the aid of a powerful magnet, is apt to be difficult as well as painful. The protecting coating of the eye must be cut, and there is danger that instead of removing the particle it may be pushed further into the eye. When the foreign body is once within the eyeball it is properly a case for the specialist.

Steel workers frequently have their hands punctured with minute pieces of metal, which become imbedded under the calloused skin. If these bits are allowed to remain the wound is likely to become infected. The use of a powerful magnet insures the removal of all traces of iron from wounds in the hand or any other part of the body. Some remarkably small pieces have been extracted in this way, one recently recovered being not one-twelfth of the thickness of a delicate needle.

Dr. C. A. Lauffer, medical director of the Westinghouse company, relates a number of instances in which the magnet has proved invaluable. Among these is the rather amusing case of a workman who attempted to drill one of his own teeth. The drill broke off about half an inch from the end and remained in the cavity and it seemed as if the only way to remove the drill would be to pull the tooth. However, a special extension was made and fitted to the magnet pole. As soon as the extension was brought in contact with the drill and the current switched on the drill was immediately drawn out.

The American Telephone & Telegraph Co., and associated and connected companies are now giving service to 100,000,000 people by means of 90,000,000 telephones and 21,000,000 miles of wire.

The voice by telephone travels from New York to San Francisco in 1-15th of a second, traveling at the rate of 56,000 miles per second. The voice of a man speaking in New York is heard in San Francisco three hours earlier, that being the difference in the standard time of the two cities.

AMERICA'S VICE-PRESIDENT TRIES ELECTRIQUETTE.

By FELIX J. KOCH.

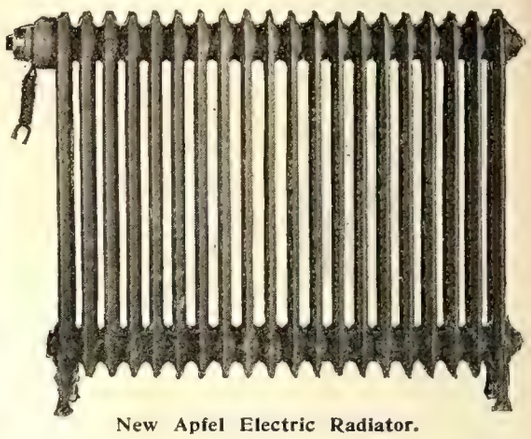
No, there are no heralds to proclaim, with sonorous: "Oh yez! Oh yez! Make way, * * * make way! The most excellent, the Vice-President of the United States"; but, instead, you hear the jingle of a little electric call-bell, then the soft whirr of rubber tires, and, lo, the Vice-President of the United States of America has gone by in an electriquette.

Of course, chances are, you do not know what an electriquette happens to be. Jack Roosa, who's been down to San Diego to see, tells us that it is a comfortable, two-seated sedan chair, fitted with much the same apparatus that drives an electric automobile. Only, it is simpler—so very much simpler that a mere child can operate it. So tired visitors to the big fair seat themselves in it, start on their journey and are soon whisked to where-so-ever they'd go; enjoying a much-needed rest mayhap the while.

Vice-President Marshall in an "Electriquette."

ELECTRICALLY HEATED RADIATOR.

A new electrically heated radiator has recently been put on the market. The heating elements are inserted through the bottom and top of the radiator. This element is divided into several sections and is connected to a multiple-pole switch which can either be attached directly to the radiator, as shown in the illustration, or placed at any convenient point desired. The consumption of energy based on a square foot of radiating surface is 30 watts to 35 watts on high heat, 15 watts on medium heat and 8 watts on low heat, giving a radiating temperature under normal weather conditions of approximately 200 deg. Fahr. on high heat. The amount of heat generated is controlled automatically by means of a thermostat.



New Apfel Electric Radiator.

A NON-MAGNETIC YACHT.

The "Carnegie," the yacht employed to make a magnetic survey of the earth, has just reached Honolulu after having passed through the Panama Canal. From there the staff will make magnetic observations in the South Pacific Ocean. These include the magnetic declination, the horizontal dip and the intensity of the magnetic field, together with studies of atmospheric electricity. The "Carnegie" is non-magnetic, being built of wood with locust spikes and copper sheathed below the water line. The auxiliary engine and all stoves are of copper; the 1,400-pound anchor is bronze; all metal fixtures are of non-magnetic material; all-brass lamps being used throughout.

FOR WOULD-BE CONTRIBUTORS.

If you've got a thought that's happy,
  Boil it down.
Make it short and crisp and snappy—
  Boil it down.
When your brain its coin has minted,
Down the page your pen has sprinted,
If you want your effort printed
  Boil it down.

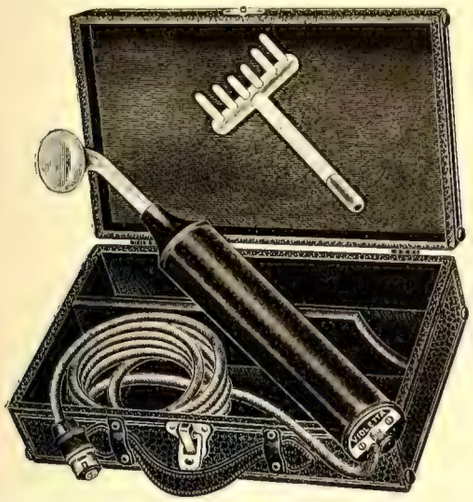
Take out every surplus letter—
  Boil it down.
Fewer syllables the better—
  Boil it down.
Make your meaning plain; express it
So we'll know, not merely guess it;
Then, my friend, ere you address it
  Boil it down.

Boil out all the extra trimmings—
  Boil it down.
Skim it well, then boil the skimmings—
  Boil it down.
When you're sure 'twould be a sin to
Cut another sentence in two,
Send it on, and we'll begin to
  Boil it down.

—*"Gumption."*

MINIATURE HIGH FREQUENCY SET.

One of the smallest practical high-frequency machines, and suitable for either direct or alternating current circuits, known as the *Violet'a*, is illustrated here-



Above: New Portable High Frequency Set Which Fits the Hand.

Below: Ozone Generator for Use With Set Above Shown.

with. This apparatus is so small it can be held in the hand while in use for generating high-frequency currents. The complete outfit, suitable for use by anyone, includes several treatment or application tubes exhausted to different vacua.

Owing to the special design of the vibrating interruptor on this device the action of same is very steady and uniform.

For those desiring to take ozone treatment a glass ozone generator is furnished at slight extra cost. It is seen in the illustration, and this instrument generates enormous quantities of ozone, which is purified by passing through a mixture of pine-needle oil and eucalyptus, and is injected into the lungs in the form of vapor by agitating the rubber bulb.

The treatment is very pleasant, and amazing results have been obtained, it is said. The ozone is driven directly into the lungs, where it is distributed throughout the body by the blood. In this way ozone inhalations not only have local effects but have excellent tonic and constitutional effects. For this reason ozone is so effective in cases of hay fever, which is the result not only of local irritations, but is also the result of lowered vitality.

Ozone also acts as a powerful germicide and disinfectant, destroying the toxin products of bacteria through its power as an oxidizing agent. Quick relief and results are stated as obtainable in cases of hay fever, asthma, rhinitis, nasal catarrh, colds, bronchitis, et cetera.

Time is electrically flashed from powerful lamps on top of the Metropolitan tower in New York City which can be read 25 miles away.

MARCONI RADIOTELEPHONY.

Mr. Marconi states that the Italian navy is using his wireless telephone system as a part of its system of intership and intersquadron communication. In some instances, he said, communication had been established between ships as far apart as 100 miles. At the present time, he added, his efforts were being directed toward the perfection of the invention for moderate and not long-distance communication. He confirmed the report, that the wireless telephone would probably be on the market in the United States within the present year.

"Our new stations at Belmar and New Brunswick, N. J.," said Mr. Marconi, "are out of commission and will probably remain so until the end of the war, because of the taking over by the British Government of the two corresponding stations in Great Britain. The British stations are being used in long distance work, some of the messages being to points as far distant as Egypt. Our station at Marion, Mass., which was built to communicate with Norway, is also out of commission, owing to the fact that Great Britain will not permit the exportation of the equipment and material necessary to complete the Norwegian terminal."

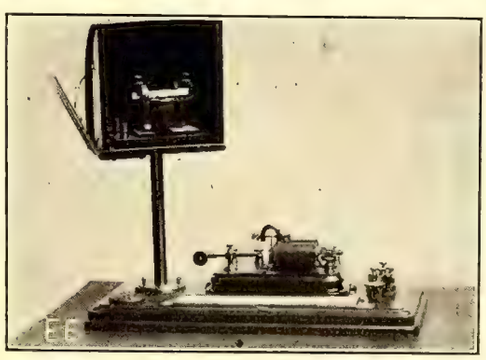
NAVAL WIRELESS IN JAMAICA.

Great Britain is erecting a powerful wireless station on the Blue Hills, near Kingston, Jamaica, according to latest reports. It is said the new station, which is 300 feet above the sea level, is intended to enable the Admiralty to send messages to the warships on the South Atlantic station.

Naval officers stationed at Kingston state that if such a plant had been in existence at the beginning of the war it would have prevented the defeat of Sir Christopher Cradock's fleet and enabled the warships on the coast to have picked up the Karlsruhe and the Dresden before they sank so many vessels.

TELEGRAPH SET THAT SIGNALED AROUND THE WORLD.

We present in the illustration shown a reproduction of the famous telegraph sounder, relay and key, as used a short time ago by Thomas A. Edison in sending the famous telegraph signal which circled the earth; repeating itself in the same office from which it had been sent



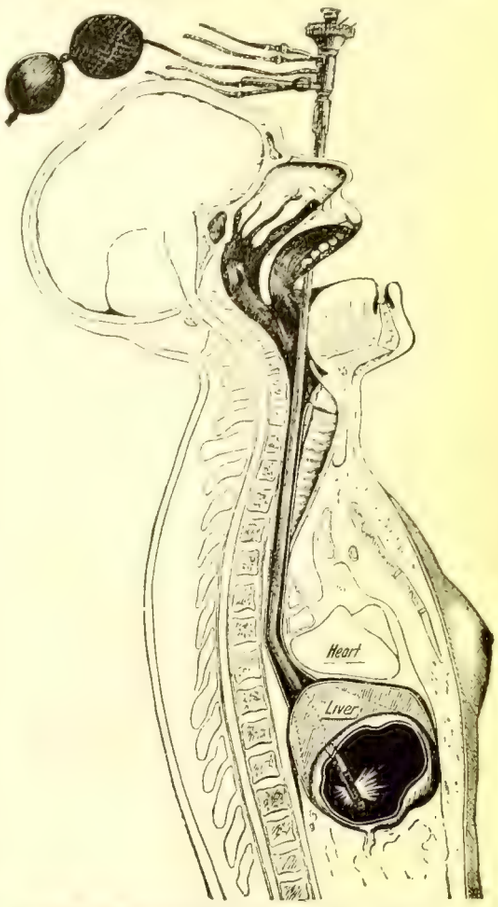
This Telegraph Set Signaled Through a 25,000 Mile Circuit.

out previously, but a few minutes before.

Of course, this was accomplished by relaying the message through several cable stations, in the globe-encircling journey. This apparatus is one of Uncle Sam's highly prized exhibits at Washington. Edison began his wonderful career as a telegraph operator, as have many of the present day leaders in industry and science.

ELECTRICAL ILLUMINATION OF THE STOMACH.

When the physician nowadays wants to find out what kind of a surface your stomach has he has other means at his disposal than the operating knife. Our illus-



How the Stomach Interior Can be Viewed by Using Small Electric Lamp and Suitable Jointed Tube.

tration shows how the perfected stomach lamp and periscope works. The metal tube of small calibre is passed through the patient's mouth and throat down into the stomach. By means of cleverly arranged reflecting mirrors in the tube the image is observed by the physician at the outer end of the tube. Rubber bulbs are shown attached for various requirements. Even surgical operations are performed through such tubes fitted with electric illumination.

MANY USES OF TUNGSTEN.

Tungsten is used principally as an alloy of high-speed steel—that is, steel used in making tools used in metal-turning lathes running at high speed—to which it imparts the property of holding temper at higher temperature than carbon steels will. The now well-known ductile tungsten is used for incandescent lamps, which are fast replacing carbon lamps. Recently greatly improved lamps, in which the wire is wound in helices and in which the globes are filled with nitrogen, have produced a close approach to white light. These lamps are furnished in candlepowers up to 2,000. Ductile tungsten is practically insoluble in all the common acids; its melting point is higher than that of any other metal, its tensile strength exceeds that of iron and nickel, it is paramagnetic, it can be drawn to smaller sizes than any other metal (0.0002 inch in diameter) and its specific gravity is 70 per cent. higher than that of lead.

If you are not a subscriber don't fail to read announcement on page 95.

New Lamp Signals on Pennsylvania R. R.

AN entirely novel signal system, differing in all respects from any ever before used by any railroad, was recently placed in operation by the Pennsylvania Railroad from Overbrook to Bryn Mawr, Pa. This is a portion of the section of the main line between Broad Street Station, Philadelphia, and Paoli, Pa., now being electrified.

The new signals are especially designed to promote safety, efficiency and economy. All moving parts are eliminated from the signal apparatus. This not only reduces to a minimum the chance of getting out of order, but is also expected to lessen the cost of installation and maintenance.

The same signals will be used both day and night. Enginemen will therefore be guided by the same code every hour of the twenty-four, with corresponding reduction of the chance of error. Necessity for distinguishing between lights of different colors is banished by using only white lights.

The feature of the new signals is the substitution, for day and night use alike, of brilliant white electric lights, showing sharply against a black background in place of the moving arms of the semaphore, now used by day, and the colored lights used at night.

All positions of the semaphore arms—horizontal, diagonal and vertical—are duplicated in the new signals by the rows of electric lights. Each signal has a sufficient number of rows of lights to be the equivalent of two semaphore arms.

To make the lights clearly visible, even in the brightest sunlight, the voltage used in the daytime will be nearly quadruple that used at night. The lamps can easily be seen in the clearest sunshine for more than 4,000 feet.

So powerful are the lamps that when the full current is used at night it is possible to read large type by their light at a distance of 1,000 feet.

Each signal will protect a block of track 3,500 feet in length. A train passing a signal will automatically set it at "stop." When the train reaches the next block the first signal will change to "caution." Another position of lights will show when two full blocks are clear and a fourth position when three or more are unoccupied.

An engineman will always receive notice of a possible stop at least 7,000 feet in advance, and will receive two cautionary signals before approaching the "stop" signal.

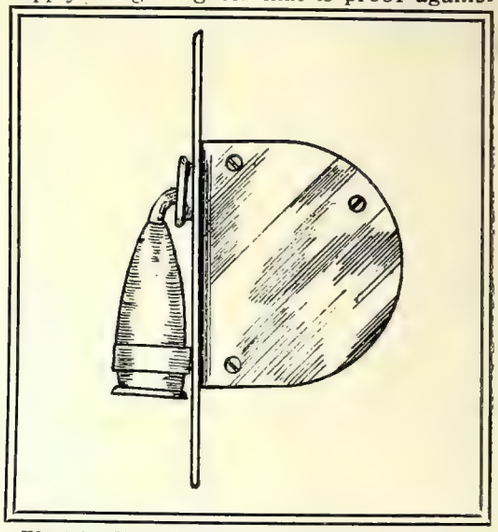
Latest Railroad Signal Employs Powerful Electric Bulbs Instead of Semaphore Arms. Lamps Can be Seen 4,000 Feet Even in Bright Sunshine.

INTERRUPTIONS IN RADIO TRANSMISSION FROM GERMANY.

The Nauen-Sayville and Hanover-Tuckerton transatlantic wireless systems, which have been transmitting the bulk of telegraph traffic between the United States and Germany since the cutting of the Emden cable, have for the past few weeks suffered severe service interruptions. Although the plants have been found to be sufficiently powerful to interchange messages, even by daylight, during the winter season, with the coming of warmer weather (and the accompanying increase of "static") communication has become impossible for a large part of each day. The Sayville transmitter is being enlarged so as to improve sending to Germany, but this will of course not aid reception in the United States. Many combinations of receiving apparatus are being tried both at Tuckerton and Sayville, in the hope of eliminating "static" interference to such a degree as to permit the German signals to be read. It is not known whether or not there will be any attempt to increase the sending power of the Nauen or Hanover station.

WINDPROOF ELECTRIC CIGAR LIGHTER.

Every smoker has experienced the difficulty of lighting a cigar or cigarette in a moving automobile or motor boat. A match is blown out instantly and even a pocket cigar lighter is extinguished by the wind. To supply a cigar lighter that is proof against the strongest wind and that works automatically is the object of a little electrical device that caused much interest at the recent Automobile Show.

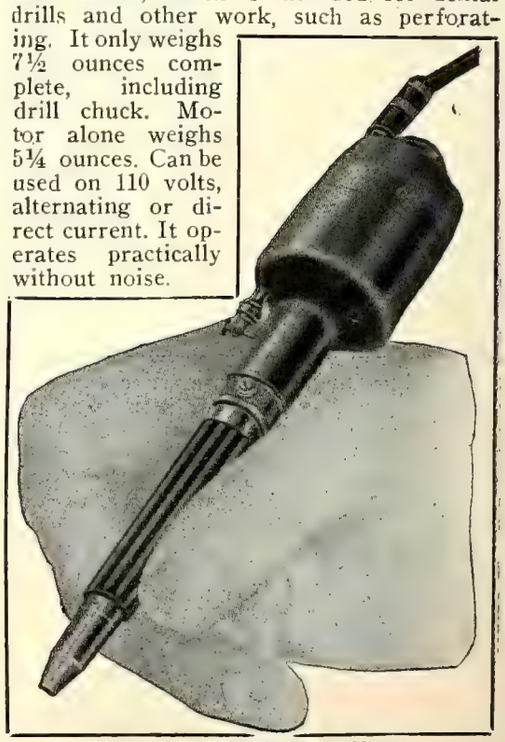


Electric Cigar Lighter Which is Windproof.

It consists of a little knob hanging from a cord. This is attached to the most convenient part of the woodwork and takes up scarcely more room than an ordinary push button. When one wants a light he simply pulls out the knob and the end instantly glows with sufficient heat to light cigar or cigarette, the cord being of sufficient length to enable one to get a light without changing position. On releasing the lighter the cord is automatically rewound and the current automatically disconnected. The lighters are attached to the dynamo lighting circuit or batteries and are made for any voltage.

ELECTRIC MOTOR FITS THE HAND.

An extremely small electric motor is here shown, which is intended for dental drills and other work, such as perforating. It only weighs 7½ ounces complete, including drill chuck. Motor alone weighs 5¼ ounces. Can be used on 110 volts, alternating or direct current. It operates practically without noise.



Electric Motor Fits the Hand.

Many other uses for this extremely neat motor will suggest themselves to the reader.

How to Build a Photophone

By Homer Vanderbilt

DR. ALEXANDER GRAHAM BELL, the inventor of the electric telephone, was the first to succeed in transmitting sound without the aid of any wire connection, although this method is not practical, but is interesting and valuable to many experimenters. His method of transmitting speech without wires will be described herewith, and details of constructing a simple photophone will be given.

This instrument will work very well for distances up to 900 feet. Dr. Ruhmer, the German scientist, has made photophones that have worked many miles. The photophone herein described was built by the writer, who has used it successfully for demonstration and experimental purposes.

Referring to the details, the transmitter is indicated at Fig. 1, and the circular transmitter head A is made from soft wood, turned out in a lathe, to the shape shown. Any wood turner will turn it out for a small sum. The diafram B is an ordinary tin one from a telephone receiver, and one side is nickel plated and highly polished; the reason for this will be explained later. The diafram is fastened to the head A by means of four small brass screws, or better, by a circular ring of wood. The supporter C is made from soft wood 10"x6"x1"; the base D measures 8"x7"x1½", and it is also made from the same material. Two small brackets are now fastened on each side of the supporter C, as shown. Next fasten the transmitter head on to the frame; this is done with two flat-head brass screws. The mouthpiece E is the ordinary telephone transmitter mouthpiece and can be readily obtained in any electrical supply house.

The receiving instruments are now to be considered. They consist of a parobolic reflector A, selenium cell K, battery B, telephone receiver R, and supporting frame for the parabolic reflector and selenium cell. The reflector is purchasable at small cost or can be made from a tin, copper or aluminum bowl. The bowl should not be larger than 12 inches in diameter. A small piece of wood B is made to support the cell K, and is held in place by means of three screws I, I, I, which are placed through three holes made in the bowl.

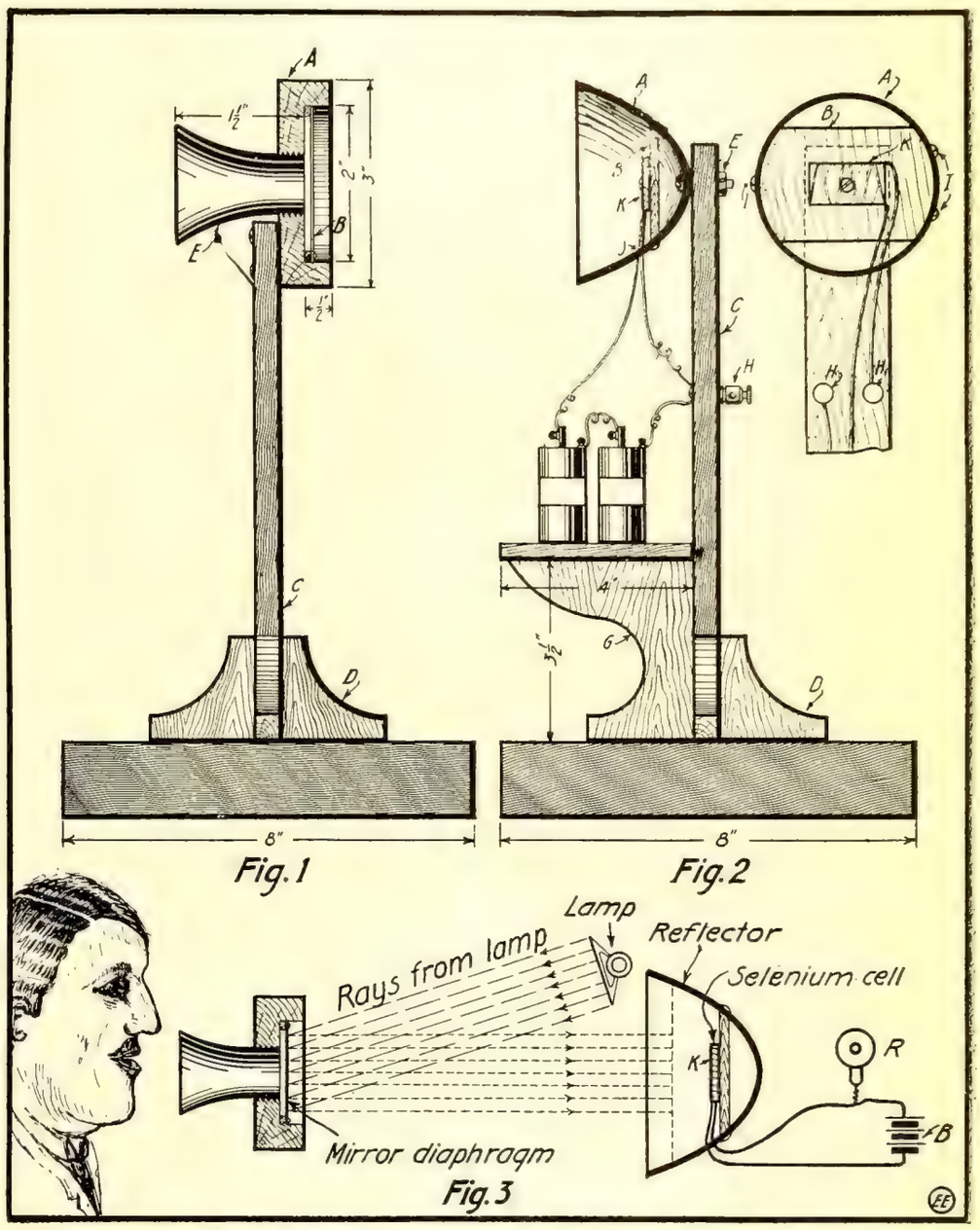
The supporting frame C and base D are made the same as for the transmitter, with the exception that C is one inch longer, as may be seen in drawing. A small wood shelf F is added, which can be 4"x8", etc. It is strengthened by means of a bracket G. The parabolic reflector is next mounted in place. It is supported by means of an 8-32 screw E.

We now come to the most difficult part of the whole apparatus, and that is the selenium cell. This can be either purchased from any reliable concern or else made. A very easily constructed selenium cell was described in the August, 1914, *Electrical Experimenter,* and no further explanation is necessary here.

The selenium cell is placed on the plate B and fastened to it by two screws. Care should be taken not to tighten the screws too tight or the selenium will crack, which makes the cell worthless. The two terminals of the cell are brought through the hole J and one of the them is connected to one binding post H, while the other one is connected to two or three batteries, which are placed on the shelf F. The other terminal of the battery B is connected to the second binding post H¹, and a telephone receiver R is connected across these binding posts.

The apparatus is now completed and ready to receive a good coat of heavy orange shellac. To operate this photophone it is necessary to place both transmitter and receiver at right angles to each other and an ordinary carbide bicycle lamp is placed in such a manner that all the rays of light fall on the polished transmitting diafram B and are thus reflected onto the parabolic reflector A, Fig. 2. A good idea of how to arrange the apparatus is shown in Fig. 3. The writer advises the builder of this photophone to use it for short distances at first, until he familiarizes himself with the working parts of the apparatus. By using a larger source of light, such as an arc lamp, the distance may be considerably increased, of course.

For those who are not familiar with the principle upon which this instrument works, the writer has endeavored to show how this valuable and interesting apparatus operates. By referring to diagram 3, the thin, highly polished diafram B acts like the diafram in the ordinary telephone; but instead of transmitting vibrations by means of varying the electric current to the receiver, it varies the degree of reflected light, which strikes the parabolic reflector A and selenium cell K. This variation of light causes a variation of resistance of the selenium cell, and since the telephone receiver and battery are connected in series, the battery current is caused to vary and in this way causes the diafram of the receiver to vibrate according to the variation of current. Thus sound is transmitted exactly as spoken into the transmitter.



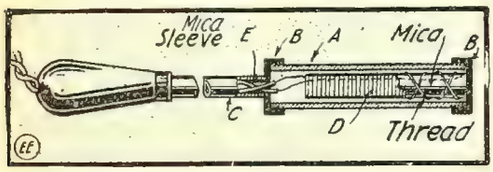
The Photophone Which Transmits Speech by Beam of Light.

It is hoped that this short article on the photophone will interest many readers, who are interested in scientific research, as a great deal of experimental work may be performed on photophones. This apparatus may be advantageously used by Boy Scouts for signaling purposes, etc.

Transcontinental telephone talk is made possible to a large extent by the De Forest audion amplifier.

AN ELECTRIC IMMERSION HEATER.

The first thing to be made for this useful form of heater is a one-inch pipe nipple A, 4 inches long, and two caps, B, B. In one of these caps drill a 5/16-inch hole and tap for ⅜-inch pipe. A ⅜-inch nipple C, about 3 inches long, is next inserted into this thread. Care should be taken to see



Simple Electric Immersion Heater.

that this case and nipple C is made watertight. This is facilitated by placing white lead on the threads.

The heating element is wound on a ⅞-inch porcelain tube D. Now wind 20 feet of No. 24 nichrome resistance wire on it, and each turn should be separated from its neighboring turn, so that they will not short-circuit each other. Lead about two feet of wire through the short nipple C. Splice on to these leads some lamp cord, or better yet, use asbestos insulated heater cord. Make the splice by twisting the wires together and insulate them with a winding of asbestos string. Try 110 volts across these leads. The element should heat up to a dull red, if not use less turns of wire. Get some thin sheets of mica and wrap them around the element, covering all exposed wire. Tie the mica on with some thread. This will hold it until placed in the case, when the thread will burn off, leaving the element insulated from the nipple by the mica. A mica sleeve E is next made and inserted in the nipple C. It is used to insulate the lead wires from the case. Turn up a short wooden handle of any desired shape and drill a hole through it. Lead the lamp cord through this hole and force the handle into the nipple. Test carefully to see that there are no *grounds* to the case. An attachment plug on the cord completes the heater. Be careful in using it, that it is always immersed, while the current is on, else it will soon burn out. The drawing shows the arrangements of the various parts.

INVISIBLE INK RECIPES.

I am sending you some formulæ for invisible ink, for which I think the experimenter may find much use on various occasions.

Recipe No. 1.—Writing fluid: 1 drachm potassium iodide; enough water to make 1 ounce. Reagent: A strong solution of bichloride of mercury; apply with a brush and the writing will come out red.

Recipe No. 2.—Writing fluid: 1 drachm potassium ferrocyanide; enough water to make 1 ounce. Reagent: 1 drachm perchloride; enough water to make 1 ounce, or 50 per cent. solution of tincture of iron; apply with a brush and the writing will come out blue.

Recipe No. 3.—Writing fluid: 1 drachm cobalt chloride; enough water to make 1 ounce. Reagent: Heat, and the writing will be blue.

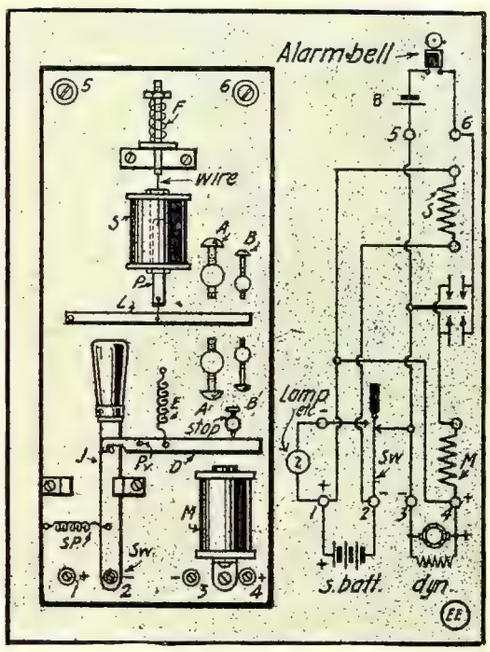
A small amount of acacia gum added to the writing fluids will improve the writing quality. I prefer the number one because it is easier to get, the paper is unstained and the writing can be erased by simply heating. I will be pleased to hear from any one who tries these formulæ.

Contributed by K. K. KNAELL.

AUTOMATIC BATTERY CHARGING BOARD.

The following is a description and illustration of a simple switchboard designed to call the operator's attention when the storage cells are fully charged or need charging. When the cells are charged to capacity the combined switch and circuit breaker shown on the lower half of the board cuts out the charging circuit, also rings a bell or similar alarm. When cells are discharged to a point consistent with safety the alarm again rings, indicating that the cells need charging.

Referring to the drawing, S is a solenoid wound with fine wire to a resistance of 120 ohms for a six-volt charging circuit. With higher voltages the ohmage of the solenoid must be increased proportionately. P is a soft iron plunger loosely suspended in the solenoid. At F is a spring and nut for adjusting the plunger, which moves *freely* in the solenoid. L is a brass bar, pivoted and connected to plunger P. A and A′ are adjustable contacts. B and B′ are also contacts similar to A and A′, but smaller. M is a strong electro-magnet wound with *large*



Clever Battery Charging Panel.

wire (No. 18 or No. 16) to resistance of *two* ohms. D is an iron armature lever shaped as shown, pivoted at PV, its end being a sort of trigger, engaging a pin attached to switch SW. SP is a rather strong spring to pull out switch blade, when released at J, over to switch contact on left.

The plunger P is made such a length as to enter less than half way into the brass solenoid tube. The plunger is drawn into the core in proportion to the rise in voltage, and released when the voltage decreases or falls. It is, in principle, a voltmeter.

Referring to wiring diagram, positive generator lead is connected to terminal 4; negative lead connects to 3. Positive storage-battery lead is connected to binding post 1 and the negative lead connects to binding post 2. Posts 5 and 6 connect to bell or other alarm in series with dry cell.

When wiring is finished and dynamo and storage cells connected to their binding posts, see that switch is in vertical position shown in sketch.

Commence charging until cells are fully charged. When this occurs, adjust contact A until it touches L. Do the same with B. This done, the magnet M attracts D, releasing switch, which is pulled to left-hand switch point by spring SP. Alarm will ring also. E is a small spring to hold the armature lever in horizontal position.

Now discharge battery to a point consistent with safety (about 1.78 volts per *cell*). Then adjust contacts A′ and B′ until bell rings. The board is now ready for steady work, requiring no attention other than throwing switch to right-hand switch point when charging.

If the dynamo is driven by an electric motor which is in series with a circuit breaker, by connecting the circuit-breaker magnet in series with the circuit-breaker magnet of the switchboard the dynamo will stop automatically when cells are fully charged.

The switch parts, binding posts, contacts, also the solenoid and magnet, which are wound to order, can be supplied by any electrical house if you don't want to make them. Contributed by

CLARENCE W. GALLINGER.

STRONG MAGNETIC FIELDS.

An electro magnet constructed by Deslandres and Perot and described in a communication to the French Physical Society last year produced a magnetic field of 41,000 gausses in an air gap 2.1 millimeters long and 3 millimeters in diameter, with pole pieces of iron. The exciting current was 24 amperes in this case. The maximum field obtained was 51,500 gausses, utilizing 30,800 ampere turns.

With special pole pieces of cobalt steel a field of 50,500 gausses was produced in an air gap 1.7 millimeters long and 3 millimeters in diameter.

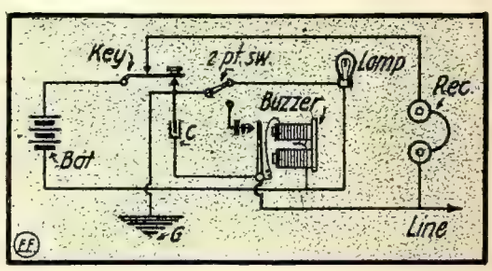
U. S. SIGNAL CORPS BUZZER TELEGRAPH.

The telegraph signaling system employed in the United States Signal Corps branch of the army is very ingenious and, as is generally known, will operate under very poor electrical conditions, as when the wire may be cut in one or more places, etc.

We show herewith diagram of connection as used in these field type, buzzer telegraph sets, and the signals are received at either station by means of head 'phones shown.

Closing the key at either instrument operates the buzzer, which creates a series of rapidly interrupted electrical impulses, having several times the voltage given by the battery owing to the high self-induction of the buzzer magnets.

This set is also arranged with a switch in some cases, so that at night the set may be utilized for flashing signals by means of a battery lamp, indicated on drawing. In this case, of course, no line wire or



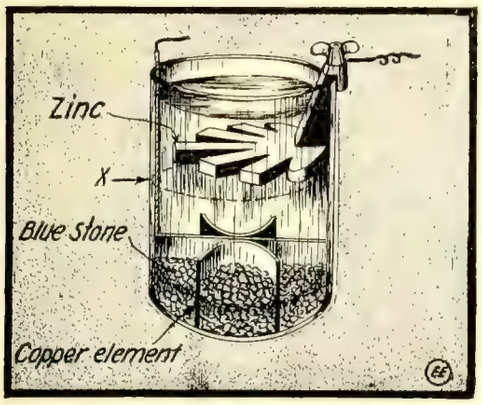
U. S. Signal Corps Buzzer Telegraph.

ground connection is necessary and the signals are observed from at a distance by means of field glasses, etc., the short and long signals of the telegraphic code being produced by giving long and short flashes of light in the battery lamp.

It may be remarked that a small condenser is usually hooked across the buzzer contracts in order to reduce sparking.

HOW TO CONSTRUCT A GRAVITY BATTERY.

To set up a gravity battery use about 3½ pounds of bluestone, or enough to cover the copper element 1 inch. Pour in water



Making a Gravity Battery.

sufficient to cover the zinc one-half (½) inch, short circuit for three hours and the battery is ready for use. If desired for use immediately do not short circuit, but add five or six ounces of "zinc sulphate."

Keep the dividing line X between the blue and white solutions about one-half inch below the bottom of the zinc. If too low, siphon off some of the white liquid and add the same amount of water, but do not agitate or mix the two solutions.

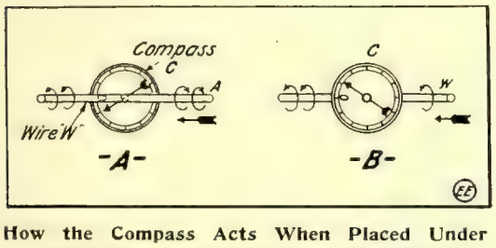
This type of battery will give about 0.9 of a volt, but only a fraction of an ampere. It is used for burglar alarm and closed circuit telegraph work very extensively.

Many amateur electricians and some professionals have undoubtedly had considerable trouble with gravity batteries. They follow directions carefully and then fail to get good results. The usual trouble is not with the battery itself, but with the circuit. A gravity battery is suitable only for a circuit which is normally closed. It is therefore undesirable for "electric bells," "induction coils" and all other open circuit apparatus requiring fairly strong current. The circuit should also have a high resistance. This makes it impractical for running fan motors, as the motor would have to be wound with fine wire. And it would then require a large number of batteries to give a sufficiently high voltage.

Contributed by W. JOHN GWINN.

DETERMINING DIRECTION OF AN ELECTRIC CURRENT.

If the current in a wire is flowing from south to north and a compass is placed under the conductor, the north end of the needle will be deflected to the west, as



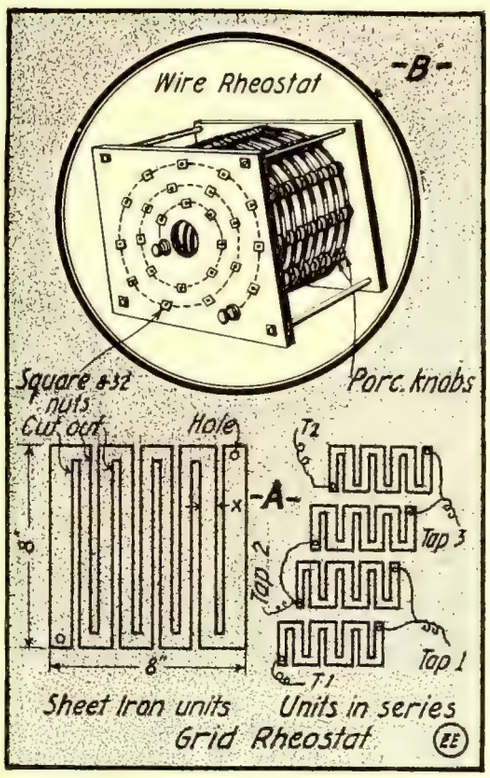
How the Compass Acts When Placed Under and Above a Live Electrical Conductor.

shown at A in sketch. If the compass is placed over the conductor, the north end of the needle will be deflected to the east, as shown at B. The compass needle should be placed parallel with the wire first. Even the current from a dry cell passing through a conductor to a bell, etc., will deflect the compass. This is the basic principle on which the galvanometer is built.

CONSTRUCTING RHEOSTATS.

Rheostats or resistance boxes are often required in electrical work, and a few types are illustrated here which the practical man will find of interest. At Fig. A is shown how ordinary iron sheet, or German silver sheeting, can be cut to resemble the grid resistances employed commercially for controlling motors, and so on.

The number of sheets used and the width of the strip X, as well as its thickness and length, are, of course, dependent upon the current required to be carried, as also the voltage drop to be effected. The physical properties of sheet metal are to be found in any handbook on electricity. It is easy to figure out the resistance required for a given load. It is equal to the volts drop required divided by the current in amperes to be used. Say, for instance, that 40 volts drop is wanted and a current of five amperes. Then the resistance of the whole rheostat must be five into 40 or eight ohms. The various grid plates can be connected in series or on parallel as desired. The total resistance of a series rheostat will be that of



Rheostat Construction and Details of Same.

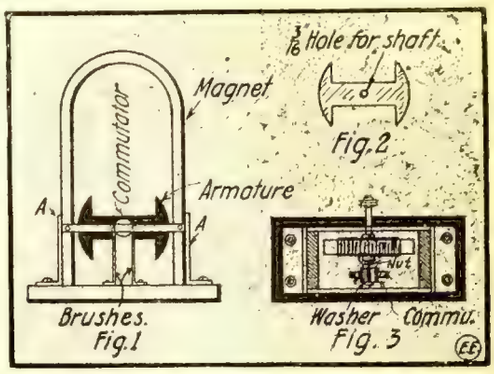
one grid multiplied by the number of grids. On parallel the total resistance will be that of one grid divided by the number of grids. The arrangement of grids in series is indicated.

A compact and cheap form of rheostat used for arc lamp ballast, etc., is the cylindrical type shown at Fig. B. Several layers of wire are used in a small space in this unique design. The turns are wound on small grooved porcelain knobs, placed on a series of $\frac{5}{32}$-inch metal rods, threaded at both ends, and secured in place between two metal end discs by hexagon or square 8-32 nuts. Tap leads can be brought out, of course, as desired from any layers or parts of layers to switch points.

When a storage battery is only partially discharged it requires only a partial charge. Charging a battery that is already full is not only a waste of current, but it is injurious to the battery, and care should be taken to cut off the current as soon as the maximum charge is attained.

HOW TO MAKE A SMALL ELECTRIC MOTOR.

A small electric motor can be readily made from odd parts by any experimenter. The magnetic field is supplied by a permanent magnet of the horse shoe type, as perceived. The armature consists of eight or



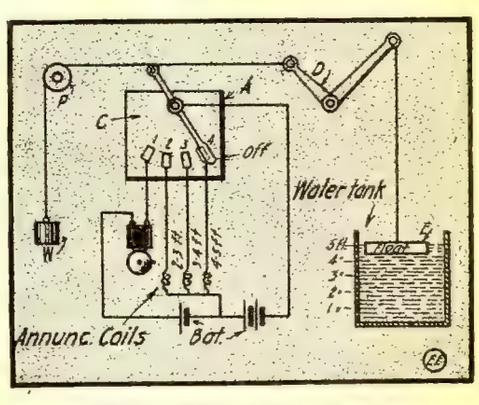
Electric Motor Which is Easily Made.

10 pieces of soft iron, cut as shown in Fig. 2, and made from No. 27 soft sheet iron, or tin will do. The armature sheets are kept in place on the shaft by two nuts which are tightened up firmly on either side or they may be soldered in place. The bearings are made of heavy sheet brass with a 3/16-inch hole on each end and one in the center, to take the shaft. Next arrange bearing support A A, of brass.

The stand consists of four, or better, one piece of brass, screwed to the base on each side of the magnet. A 3/16-inch shaft threaded at the center carries the commutator and armature. The commutator is made from a wooden cylinder ½ inch in diameter and ½ inch long, and it is secured on the shaft by forced fit. The wooden cylinder is now covered with some heavy tin foil, which must be securely glued on and afterwards cut into two pieces, to make the two segments as shown in Fig. 3. Now wind the armature core with seven or eight layers of No. 24 insulated magnet wire and carefully fasten the ends to the two commutator segments by small nails or screws. Two short pieces of sheet brass for brushes are next bent, as shown in Fig. 1, and are secured to the base by means of two brass screws. These strips act as brushes and should touch the commutator very lightly, but at the same time making good contact with the commutator.

A WATER-LEVEL SAFETY ALARM.

A very simple water-level safety alarm can be readily rigged up by following the instructions and drawing given herewith.



Simple Water-Level Alarm.

At first construct a trip switch A shown in drawing, which consists of brass contacts 1, 2, 3, 4, and a lever B mounted on a suitable base C. Next construct the lever arm A with its float E. After these parts are completed mount them on a wooden

(*Continued on page* 102.)

WRINKLES—RECIPES—FORMULAS

Edited by S. GERNSBACK

Under this heading we will publish every month useful information in Mechanics, Electricity and Chemistry. We shall be pleased, of course, to have our readers send us any recipes, formulas, wrinkles, new ideas, etc., useful to the experimenter, which will be duly paid for, upon publication, if acceptable.

FORMULA No. 11.
Photographic Baths.
(DEVELOPERS).

Eikonogen Developers.—No. 1. 20 oz. *Distilled Water,* 2 oz. of *Sulphite of Soda* (cryst.), ½ oz. of *Eikonogen Crystal.* No. 2. 20 oz. *Distilled Water,* ¾ oz. *Carbonate of Potash.* Mix No. 1 and 2 in equal parts, and to each ounce add 2 to 4 drops 10 per cent. solution *Bromide of Sodium.*

Hydrochinon Developer.—No. 1. 10 oz. *Distilled Water,* 2 oz. of *Sulphite of Sodium* in cryst. chem. pure, 1 oz of *Hydrochinon.* Dissolve and keep in a yellow bottle. No. 2. 10 oz. of *Distilled Water,* 2 oz. of *Carbonate of Potash,* 1 oz. of *Carbonate of Soda.* Mix 2 drm. of No. 1 and 1½ drm. of No. 2, then add 3 oz. of *Water* (dist.).

Combined Hydrochinon and Eikonogen Developers.—No. 1. 60 parts of *Sulphite of soda* (cryst.), 40 parts of *Crystal Soda,* 1,000 parts of *Distilled Water.* After solution filter. No. 2. 50 parts of *Eikonogen,* 50 parts of *Hydrochinon.* Place together in a mortar, grind down to fine powder and keep dry in well stoppered glass bottle. For use take one part of No. 2 and dissolve it in 100 parts of No. 1. This developer is one of the best known; it possesses all the advantages of the other developers, without their disadvantages.

Iron Developer.—No. 1. 120 gr. of *Citric Acid,* 88 gr. of *Carbonate of Ammonia,* 1 oz. of *Distilled Water.* No. 2. 140 gr. of *Sulphate of Iron,* 1 drop of *Sulphuric Acid,* 1 oz. of *Distilled Water.* To 3 parts of No. 1 add 1 part of No. 2.

Ferrous Citro-Oxalate Developer.—No. 1. 1 oz. of *Neutral Oxalate of Potash,* 2½ oz. of *Bromide of Potassium,* 5 oz. of *Hot Distilled Water.* No. 2. 2 drm. of pure *Proto-Sulphate of Iron,* 2 oz. of hot *Distilled Water.* Mix together 2 parts of No. 1 and 1 part of No. 2.

Pyro Developer.—Dissolve and keep in tight fitting stoppered bottles. No. 1. 50 grn. of *Pyrogallic Acid,* 150 gr. of *Sodium Sulphite,* 10 gr. of *Citric Acid,* 1 oz. of *Distilled Water.* No. 2. 50 gr. of *Potassium Bromide,* 1 oz. of *Water.* No. 3. 2 drm. of *Ammonia* (0.880), 2¼ oz. of *Distilled Water.* Take 1 part of each and mix.

Tintypes Developer.—1 oz. of *Distilled Water,* 14 grn. of *Sulphate Iron,* 10 gr. of *Saltpeter,* 30 min. of *Acetic Acid,* 2 min. of *Nitric Acid.* S. G.

NEW INVENTIONS IN PHOTO-PLAYS.

(*Continued from page* 86.)

for many years, which consists of making the suspected thief or criminal hold some rice in his mouth. The suspected persons are lined up in court and sentence pronounced; afterwards the rice from each one of their mouths is removed and examined by experts. The one from whose mouth the rice shows no moisture is invariably the guilty one; as it is claimed that although their faces may not show any change of emotion when they are guilty there is an inward muscular and nerve action taking place which causes the saliva to be checked and thus the mouth remains dry.

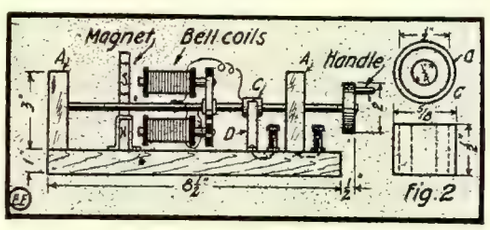
AN ELECTRIC TICKLER.

A very simple but amusing little machine can be made by anyone who is familiar with the handling of common tools. The following material will be necessary in order to construct this little alternating-current dynamo. Two electro-magnets, taken from an old electric bell; a 5-inch horseshoe steel magnet; two brass standards, A A, 3x½x½ inch; 4 inches of ¼-inch round brass rod; ½ inch of ½-inch diameter round rubber rod; also a wooden base 8½x5x1 inch, two binding posts and brass wood screws.

At first mount the steel magnet in an upright position by means of a brass strip as shown. Next construct the armature, which consists of two electro-magnets mounted on ¼-inch brass shaft. Upon this shaft mount a collector ring C, which is made from hard-rubber rod, shown in Fig. 2. A brass cylinder (a) is then put on the rubber rod.

The shaft is supported by means of two brass standards as shown. One terminal of the electro-magnets is soldered to the shaft, while the other terminal is soldered to the ring C. A brass spring D is next placed on the base so that it will touch the ring C as shown. A small handle and disc are next made and placed upon the shaft.

Connections are made from one standard and from the brass spring D to the two binding posts. By turning the crank handle and holding two conductors, which are



Two Rotating Magnet Coils Make this Electrical Tickler or Shocker.

connected to standard and spring, a shock is obtained. By turning the electro-magnets faster or slower the strength of the shock is varied in proportion. This is the principle of large dynamos, and the first electro-medical machines made by Kidder and others were similarly designed. A couple of tin handles about ¾x4 inches serve very well.

OUR NEXT NUMBER

Will have as a special supplement a large picture of

MARCONI

suitable for framing. This will make an ideal portrait for your den or home.

There will also be many new features in the August issue. Be sure to order your copy now.

A WATER-LEVEL ALARM.

(*Continued from page* 101.)

base. The pulley P is placed on left-hand side of the base as shown. An electric annunciator is connected to three of the plugs of the switch A, and the last contact is made with a bell. The connections are shown in the drawing. Now if the amount of water decreases the float will sink, and as soon as the level is below the 4-foot line the switch arm will make contact with the next contact piece and the annunciator will show its 3-4 feet drop. Next will come 2-3 feet, and then, when the float has sunk below the 2-foot line, the arm will come upon the last contact and the alarm bell will ring, notifying the engineer that the tank is nearly empty.

BOOK REVIEW.

"Elementary Electricity and Magnetism." By William S. Franklin and Barry MacNutt, 174 pages, 153 illustrations. Cloth, 7½x5 inches. Leather back. The Macmillan Co., New York. Price, $1.25.

This book is rather refreshing in a way, considering the method used in explaining the elements of electrical units, circuits, magnetism, etc. Practical aspects of the action taking place in electrical and magnetic circuits are explained in a very logical way with the aid of special diagrams. It is a good book for students of all classes and really gives a thorough understanding of the electro-physical action occurring. The heating and chemical effect of electricity is explained with simple formulæ, so that anyone can understand them.

A particularly interesting section deals in an excellent and new manner with the "electric charge and the condenser." This section explains such vitally interesting things also as "spark discharge and corona," "electrical precipitation of smoke and dust," etc.

"A School Electricity." By C. J. L. Wagstaff, M.A. 250 pages and 136 illustrations. Green cloth, 9x6 inches. G. P. Putnam's Sons, New York. Price, $1.50.

Mr. Wagstaff has presented his treatment of electricity and magnetism in a rather new way, so to speak. The magnetic field of force is thoroughly covered and some new curves and figures of the magnetic flux field around different magnets and circuits are presented. This is a good book for the student and will undoubtedly give him a very keen perception of the laws of magnetism and electric currents.

Each chapter has a number of questions at the end of same, and numerous practical experiments are described. All teachers of electrical subjects would do well to look over this work. About a dozen fine plates appear at the end, showing clearly how the magnetic flux appears in the field of various magnet poles.

"The Boy Electrician." By Alfred Powell Morgan. 394 pages, 324 illustrations. Cloth. 8vo. Price, $2.00. The Lothrop, Lee & Shepard Co., Boston, Mass.

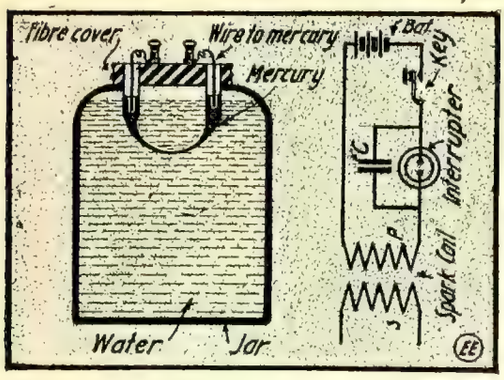
A new and extremely practical book for the boy and young man is this latest work of nearly 400 pages from the pen of Mr. Morgan. Every kind of intrument imaginable is described in attractive style, with excellent working drawings to guide the builder of same. A good feature is that which incorporates half-tone or photographic views of the various completed apparatus so that the reader will be sure to understand just how each instrument looks when finished. Wireless apparatus as well as high-frequency coils for demonstration, etc., are clearly described.

BIRD CROSSES WIRES.

Recently mention was made of a cross on a line in California caused by a snake, says *Telegraph and Telephone Age.* Now J. L. Henritzy, superintendent of telegraph of the Colorado & Southern Railway, Denver, Col., writes that one of his linemen cleared a cross by removing a Chinese pheasant, whose neck was in the twist of two wires. As the bird had not been dead over an hour, it made a toothsome morsel for the table, besides supplying beautiful long tail plumes.

UNIQUE SPARK COIL INTERRUPTER.

Here is a description of a really practical interrupter which gives perfect satisfaction on coils up to 3-inch spark. With



Unique Mercury Interrupter for Small Coils.

this interrupter sticking contacts, etc., are unknown.

To construct the apparatus, secure a two-pint "Mason" fruit jar and cut from fiber a cover to fit. Bend and draw out a glass tube as shown, making the hole in the middle of the bend almost as small as that in a thermometer tube. Bore two holes through the fiber cover and fit the arms of the glass tube tightly into them. Mount two binding posts on the fiber top and connect short pieces of No. 14 copper wire to them as shown.

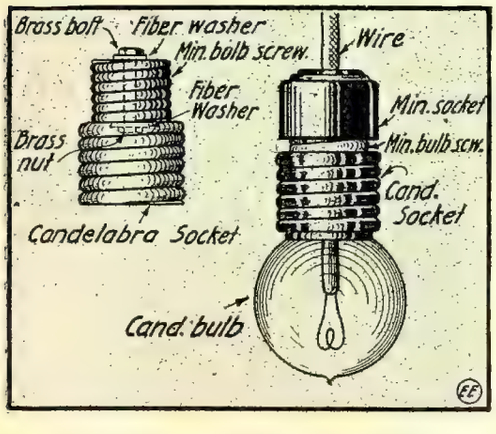
To operate, fill the jar with water to the level shown, and the bent glass tube with mercury to about the same level. Experiment will show the exact height to which the tube must be filled. Now connect the interrupter in series with the spark-coil primary, key and battery, having previously removed the hammer interrupter or bridged it across with wire. As soon as the current is switched on a bright green spark will appear in the tube.

The water in the jar serves to carry off the heat generated. The interruptions are of a higher frequency than those obtained with a vibrator and are steadier. This interrupter was invented by Mr. H. Gernsback in 1904. Contributed by

JAMES L. GREEN.

MAKING CANDELABRA BASE LAMPS FIT MINIATURE SOCKETS.

Secure an old burned-out miniature bulb; break the glass and scrape the plaster of paris out. Take the fiber washer out



How to Use Candelabra Base Lamps in Miniature Sockets.

and put it on the other side; then put the bolt through. Then place the candelabra socket on and put a fiber washer in it. Clamp the nut and screw up tight. If when screwed in a miniature base it refuses to work, melt a drop of solder and put it on the head of the bolt, but be sure the bolt is well insulated from the brass socket. Then screw it on a miniature socket and put in your candelabra bulb. Contributed by ALBERT PETTY.

BEDSPRING AERIALS.

I find that when using small radio receiving sets that they work better by using a steel woven wire mesh bedspring for an aerial than an indoor aerial consisting of five strands of copper wire, 1 foot apart, having a total length of about 60 feet.

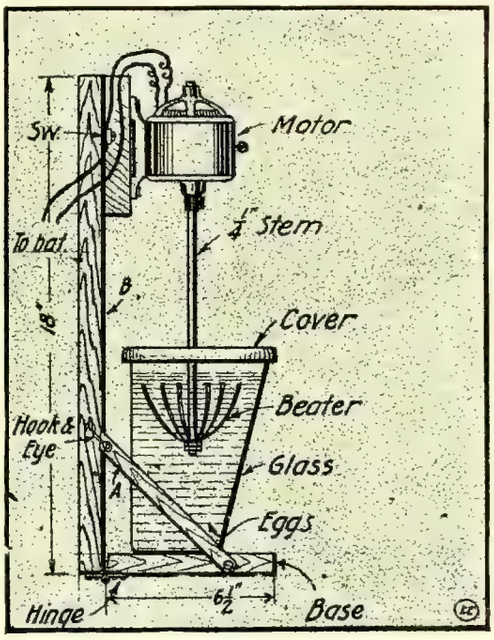
Contributed by E. J. BACHMANN.

The trans-Atlantic wireless stations in Germany have been heard clearly at the University of North Dakota radio station, a distance of 4,300 miles.

ELECTRIC EGG BEATER.

Secure a base 6½ inches long and hinge it onto an 18-inch upright piece as shown. Fasten a block 2 inches thick at top and to this fasten an electric motor. Fasten on the shaft a ¼-inch brass stem and then solder some light strips of tin to the end and bend as shown.

The base has a hinge so it can be low-



Egg Beater Driven by Small Motor.

ered to put glass of eggs on. A is a brace which can be hooked onto B. The motor may be arranged to slide up, so as to remove beater head from eggs or phosphate container without hinging upright. Contributed by CLARENCE LINDGREN.

A TIN-FOIL ADHESIVE FOR CONDENSERS.

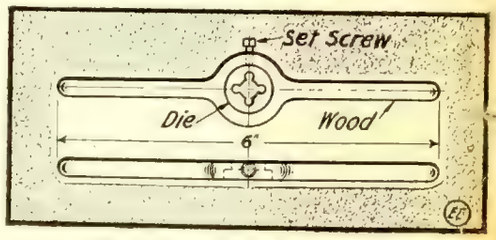
A very good way to secure tinfoil on condenser plates, and one which will not cause blistering, which is so disastrous to condensers, is as follows: Place the plates to be coated in a moderately warm oven and heat them for about 5 minutes. Then remove them and rub the surface with beeswax. Place the tinfoil over the wax and smooth down. It is advisable to place a lug of thin copper ribbon on the plate under the tinfoil before the tinfoil is put on. The corners should be painted with beeswax after the tinfoil has been placed on the glass. It is best to round the corners of the tinfoil sheet. Beeswax is far superior to shellac for this purpose.

Contributed by

WALTER FRANSEEN.

WOODEN DIE HOLDER.

I am sending you a drawing of a home-made wooden die holder which I used because I did not have the right-sized holder for a small die. Bore hole half way through the wood handle as shown, so that die will fit very snugly. Bore a small hole for the threaded rod to go through. Put



Die Holder Made of Wood.

die in larger hole and thread a screw in the notch on the edge of the die as usual. This holder will do real serviceable work.

Submitted by

NELSON RULAND.

HOW TO MAKE SOLDERLESS CONNECTIONS.

Perhaps some readers find trouble in making a good wire connection when solder is unavailable. I think they will find the following very efficient, especially with aluminum wire.

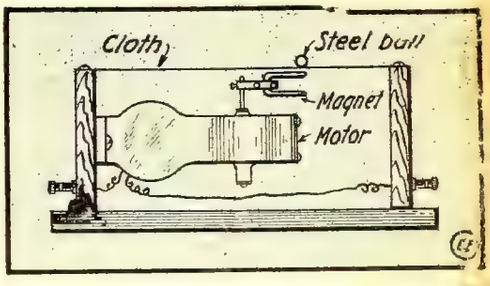
First, scrape about eight inches of the wire to be connected. Be sure all corrosion, dirt, or grease is scraped off thoroughly. Then twist the wires together very tightly. A piece of tinfoil about an inch wide is lapped over the connection twist. The tinfoil should be lapped as tightly as possible without tearing, then pressed together with the fingers. After this lap one or two layers of tape over the tinfoil, so no corrosion or rain can get to the tinfoil. The tape is pulled very tight so as to insure a good connection between the tinfoil and the wire. It is well to paint it with asphaltum.

It should be understood that this little scheme should only be used when solder is not handy.

Contributed by D. K. WALKER.

A MAGNETIC WINDOW ATTRACTOR.

Make a small box 8x4x4 inches. Two inches from one end put a block 3x2 inches. Upon this place a small motor so that the armature does not project over the top. To the armature fasten a small stick with a horseshoe magnet attached to one end of it. Put a very thin piece of cloth over the



Show Window Novelty Easily Made.

top so the inside of the box does not show. Arrange it so that the magnet nearly touches the cloth. On top put a steel ball bearing. To each end attach a binding post. the ball will follow the rotating magnet. A glass mirror top on the box is best, but requires a stronger magnet than when cloth is used. Contributed by

EARL PRATT.

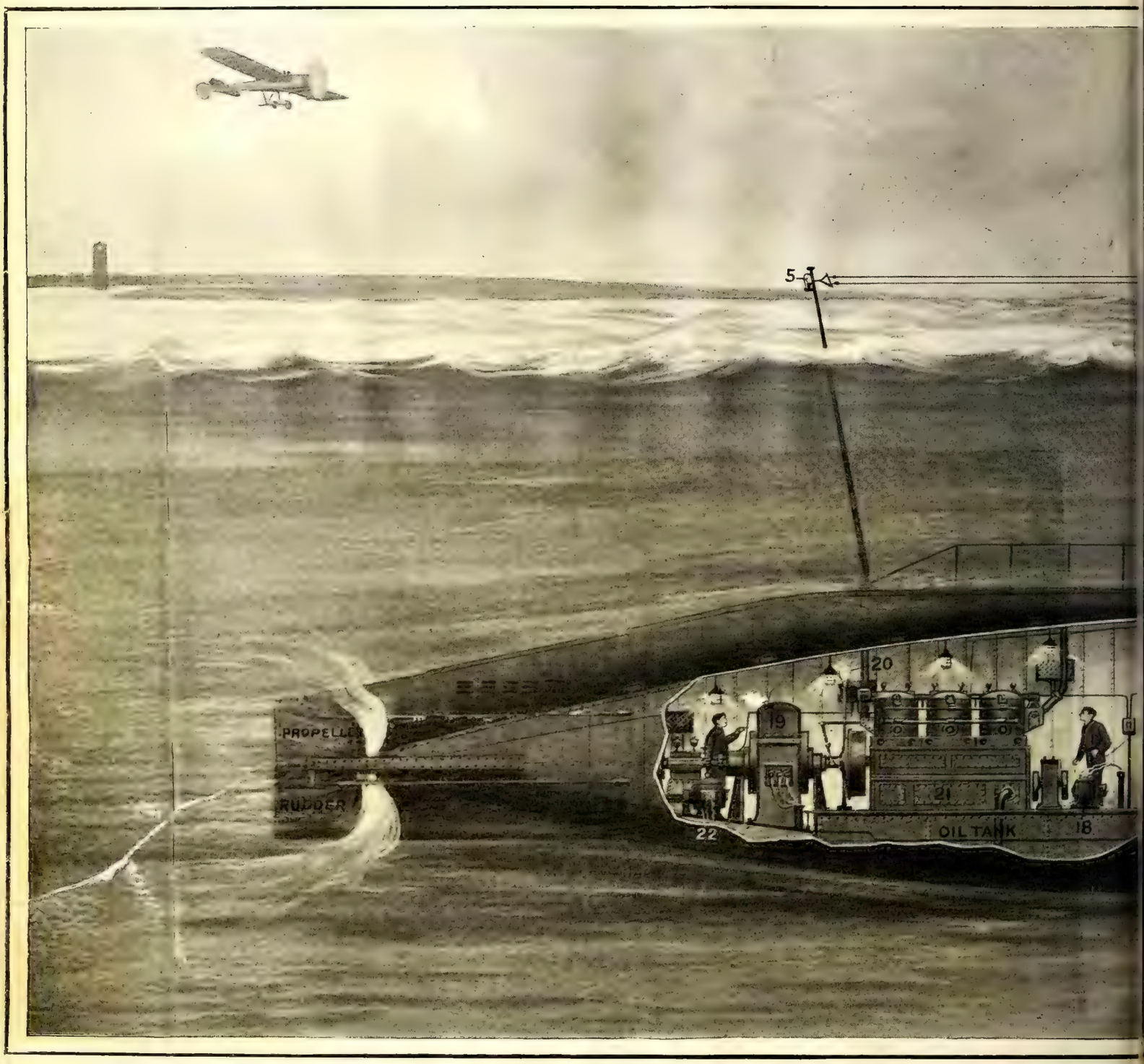
ELECTRICITY, THE POWER

By

THE submarines have proven, even thus far in the great European war, that they are indeed of extremely valuable service and that even though they are much cheaper to construct than the wonderful "dreadnoughts" costing ten to twelve million dollars apiece, they can on the surface of the water they invariably make use, of course, of gasoline or internal combustion engines, using crude oil such as the Diesel type.

For this kind of cruising some of the latest United States submarines make use of a 900-h.p. Diesel oil engine, which from Florida without incident, under their own power. Thus, it is seen that Uncle Sam's underwater boats are on par with those of the German and other navies.

At present there are about 35 submersibles in actual commission, and the total number, including those being built and



KEY

1. Periscope for viewing the enemy from below the water line, as perceived.
2. Electric search light for use on surface, when cruising.
3. Centralized control standard for surface cruising.
4. Wireless Antenna.
5. Electric signal and running lamps.
6. Periscope view finder.
7. Telephone.
8. Centralized control standard for submarine running.
9. Latest type gyroscopic compass.
10. Electric lights.
11. Wireless switchboard and appara
12. Electric trigger for discharging tor
13. Electric submarine signalling device

very easily and shortly, under certain conditions, dispatch these great fighting-ships to the bottom of the seas in a few minutes' time.

Probably more than is generally realized, electricity is really the backbone of these wonderful underwater engines of destruction. When these submarine boats travel makes it possible for these boats to attain a speed of 14 knots, and sufficient oil fuel is usually carried, enabling them to make a cruise of 5,500 miles.

Several of the submarines of this type, which took part in the recent Naval Demonstration and Review in New York Harbor, made a 1,500-mile run up the coast those undergoing repairs, is 55.

Electricity is the wonderful form of energy which enables these craft to be propelled through the water submerged for distances of 100 and more nautical miles at a maximum underwater speed of from 10½ to 11 knots. Powerful electric motors drive the propeller blades for this under-

IND THE SUBMARINE BOAT

Secor

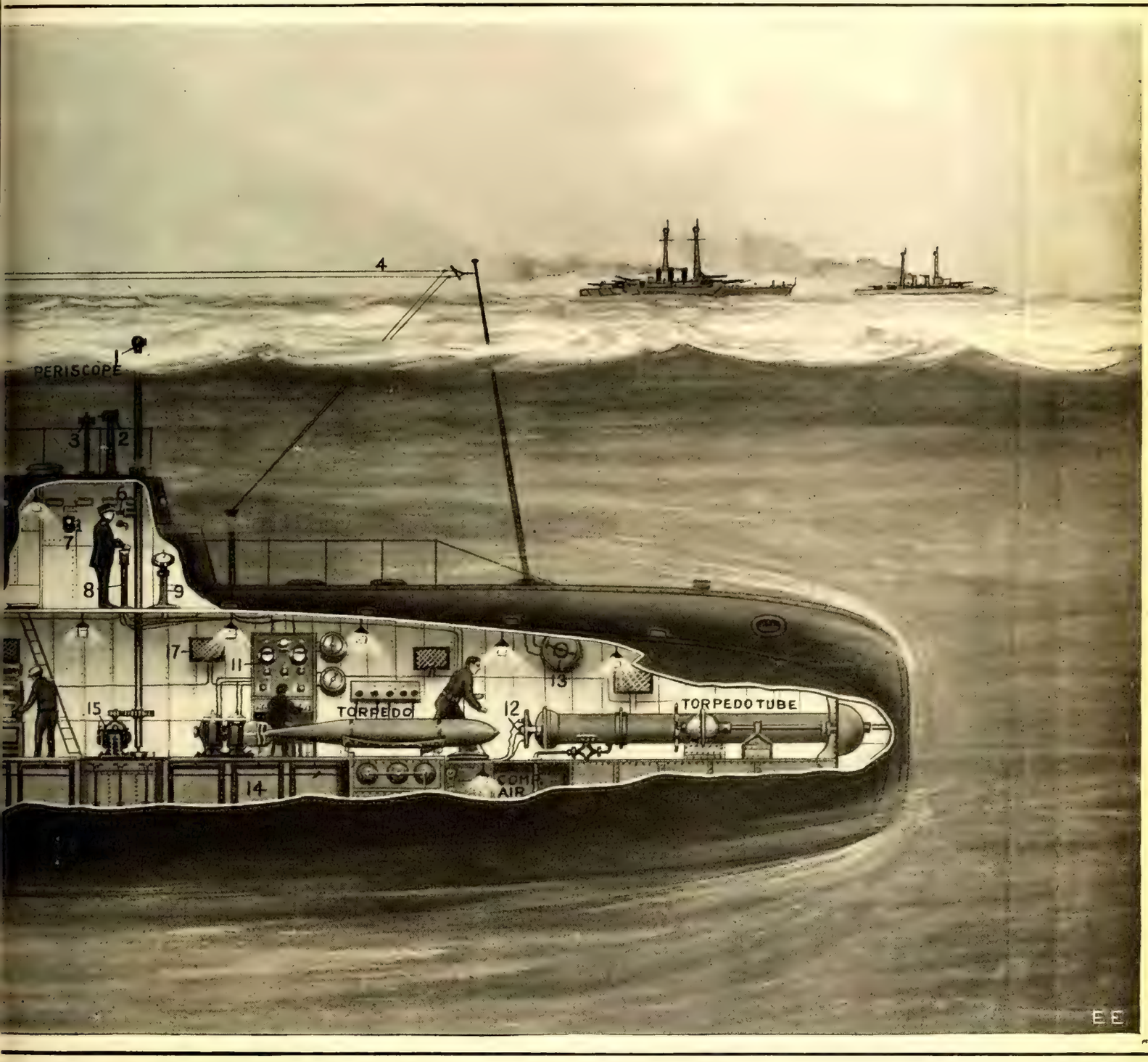
water propulsion, the motors developing 650 h.p. at the above full-speed rating in knots. These motors and all of the other electrical appliances on board the submarine obtain their energy from storage batteries, which, of course, have to be quite large. Practically all storage batteries used for these installations are of the usual lead type.

These batteries make use of sulphuric acid, of course, and hence they give off very poisonous fumes, which often endanger the health or even lives of the crew when the boat is submerged for a number of hours. Therefore several inventors, including Thomas A. Edison, are and have been working for a considerable time toward perfecting a storage battery for this class of work which would not give forth poisonous fumes, etc.

Mr. Edison's latest submarine storage battery promises to fulfil these requirements in very good shape, besides having several other features which can be turned to good account in the submarine installation, such as revitalizing the air, etc.

The illustration herewith given shows a number of the more important uses to which the electric current is put on board the submarine. Of course, all the larger and latest type boats of this character carry a high-grade wireless set to be used with an antenna supported between two steel masts, as will be seen. It is claimed that the Germans have obtained much of their inside or secret information from spies, etc., by means of wireless messages sent out from secret or hidden wireless stations on land in England, and which messages have been picked up by some of the German submarines lying off the coast a few miles. These submarines can then of course, cruise away until they get within touch of some wireless communication

(*Continued on page* 124.)



TRATION

Photo (C) By E. P. Co.

Large storage battery.
Electric motor for turning periscope.
Electric stove for cooking crew's meals.
Electric heaters for warming the interior of the submarine.
18. Circulating pump for engine, driven by electric motor.
19. Powerful electric dynamo used for charging batteries on surface, which acts as electric motor for driving the submarine when below surface.
20. Shifting gear to throw propeller on engine or motor drive.
21. Internal combustion engine, such as Diesel type.
22. Electric motor operating steering gear.

ELECTRICITY, THE POWER BEHIND THE SUBMARINE BOAT

By H[illegible] Secor

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(Continued on page 124.)

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Photo (C) By E. P. Co.

WIRELESS DEPARTMENT

New Arc Radio Set For Ships

A NEW arc type wireless outfit was recently developed by the DeForest Radio Telegraph & Telephone Co. for use on ships. The photograph shows the complete outfit as it is installed on the steamship *Wm. Chapman.*

The transmitting set consists of an arc of special design, shown at center of switchboard in photograph. This arc contains two gaps in series, operated by 600

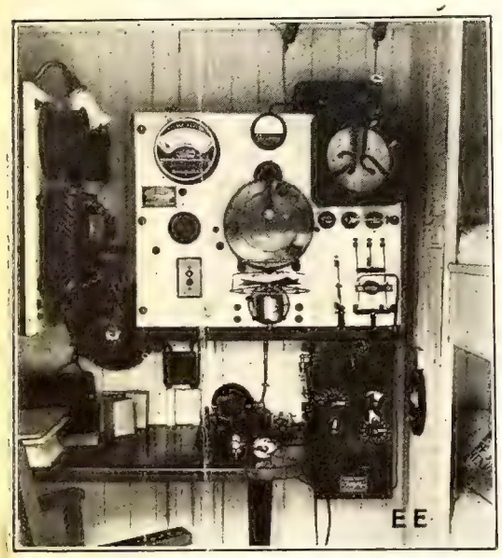


Fig. 2. Showing New Arc Radio Generator Installed on the Steamship "Wm. Chapman."

volts direct current, supplied by a motor-generator set.

The electrodes, P in the diagram, Fig. 1, consist of an alloy of platinum which has a very high melting point. The large discs O act as heat radiators, and the gap is also cooled by a fan below it, as shown. The gap between the electrodes is regulated by a thumbscrew Q placed in front of the arc. Fig. 1 shows the exact construction of this arc. The secondary circuit of the arc consists of a condenser behind the switchboard, a helix mounted on the right-hand front corner of the switchboard, hot wire radiation ammeter and a control switch for changing from 600 meters to 300 meters wave length. An aerial throw-over switch is also mounted at the extreme right. The primary circuit includes an ammeter mounted on the extreme left of the switchboard and connected in series with a choke coil, etc., as the diagram indicates.

The most interesting part of this arc is in starting it. When starting every arc it is first necessary to close both electrodes together and after separating them an arc is then formed, but with this radio arc it is only necessary to close a switch, which short-circuits the generator for a moment through a powerful choke or impedance coil and suddenly opening the switch. As soon as the switch is opened an arc is formed at this contact of the switch, which is extinguished by blowing it. The arc at the special gap electrodes is immediately formed. The distance between the gaps is about one-eighth of an inch long.

When in operation this arc produces undamped oscillations which cannot be received with the ordinary detector on ships, so a specially designed rotary commutator is employed for changing these undamped oscillations into ordinary spark oscillations of lower frequency. This device is called a "chopper" and is seen on top of the table. With this chopper the operator can send to ships and also to land stations having the Poulsen tikker receiving outfits just by cutting out the chopper, which is done by means of a double-pole single-throw switch next to the motor when the arc's undamped waves are sent out.

The motor-generator is located in the engine room and is operated by a hand control switch and an automatic solenoid switch. The panel on the extreme left of the room shows the generator board with all the necessary instruments, including ammeter, etc.

This particular outfit is rated at 2 K. W. and a maximum aerial reading of 5 amperes is obtained. The aerial consists of six wires 40 feet long. The receiving outfit consists of the latest type Audion detector and is seen on the right.

Simplicity is the principal feature of this well-built set, which is a new departure in American-made wireless apparatus.

THE KEYSTONE WIRELESS ASSOCIATION.

The Keystone Wireless Association was organized in February, 1915, with six members, B. Bimson, William Boyle, L. Clancy, H. Forker, S. Hancox and W. Rusling.

The members meet in the basement of Brother Bimson's house every Saturday night at 8 o'clock to practise the code and qualify for a license, or anything else that they wish to do. We have a small library with wireless books such as *The Electrical Experimenter.*

We would like to have any young men interested in wireless and between the ages of 17 and 25, inclusive, to join. Anyone desiring information will receive same by writing or calling on S. Hancox, 685 Lexington avenue, Brooklyn, N. Y., any evening.

RADIO CLUB OF AMERICA MEETING.

The last meeting of the Radio Club of America before the summer holidays was held May 29 in Fayerweather Hall, Columbia University.

NEW ARC FOR RADIO-TELEPHONY.

A new system of radio-telephony was recently put into operating condition by a Brooklyn inventor. Short distances up to five miles have been covered very successfully with this new system, which employs a special arc.

The telephone transmitter oscillation generator consists of a specially designed arc with a gas chamber that receives illuminating gas, and also ammonia gas under high pressure is sent through a small co-

Inventor Using His Improved Type Radiophone Arc.

axial hole in the metallic anode. This gas is used to maintain the oscillations steadily and at the same time to cool the arc, thereby eliminating the use of water for cooling the anode. A variable capacity and an inductance is shunted across the arc in such a manner that a continuous stream of oscillations is produced. The frequency of these oscillations was controlled by means of the variable capacity of the air dielectric type. The arc was operated on 11,000 volts A. C. and continuous oscillations with a constant amplitude are readily produced.

The variation of sound is produced by a specially designed water-cooled transmitter. Under operating conditions the transmitter has stood continuously three amperes without any sign of heating whatever. The receiving set was the ordinary crystal type with an inductance and a variable capacity. The inventor has found that a combination of galena and zincite gave the clearest sound in the receiving set.

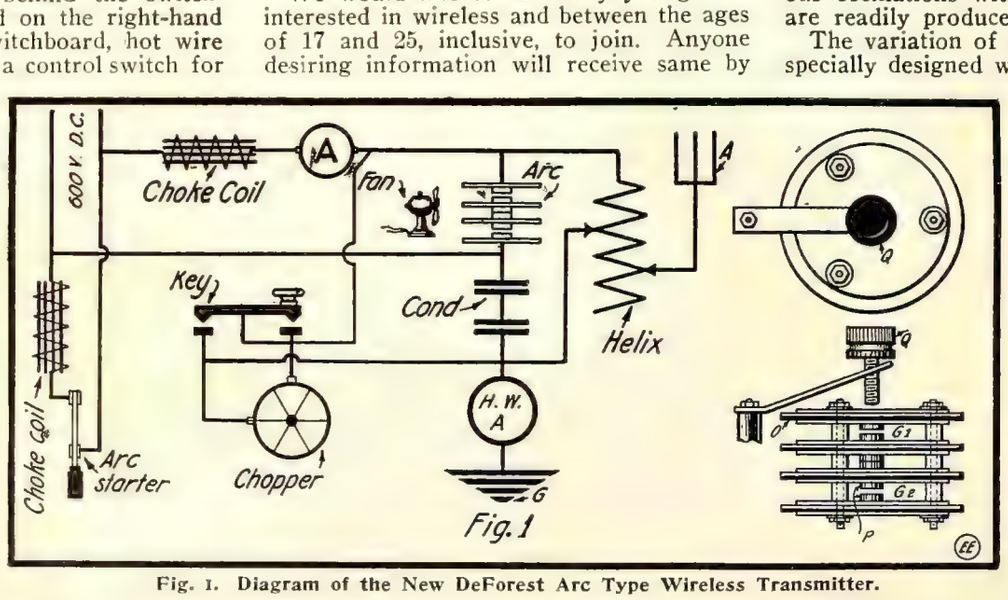


Fig. 1. Diagram of the New DeForest Arc Type Wireless Transmitter.

Dr. Alfred N. Goldsmith, of the College of the City of New York, presented a most interesting and instructive paper on "Foreign Radio Apparatus." The paper was plentifully illustrated by lantern slides. The Telefunken, Goldschmidt, Lorenz and Poulsen, Berliner-Poulsen and Compaignie Générale Radiotelégraphique systems' apparatus were shown by lantern slides and later discussed by R. H. Marriott, B.S.; Dr. Zenneck, Dr. Wheeler and others.

A Wireless Lecture Set

A simple, yet effective, wireless lecture or demonstration set is always in great demand, and herewith is illustrated and described a satisfactory outfit of this type which can be built for a reasonable sum.

The apparatus comprises a filings coherer, a decoherer, two relays of about 75 to 100 ohms resistance or even less (but preferably of a much higher resistance than this), together with controlling switches, batteries and the electrical devices to be controlled by the relays.

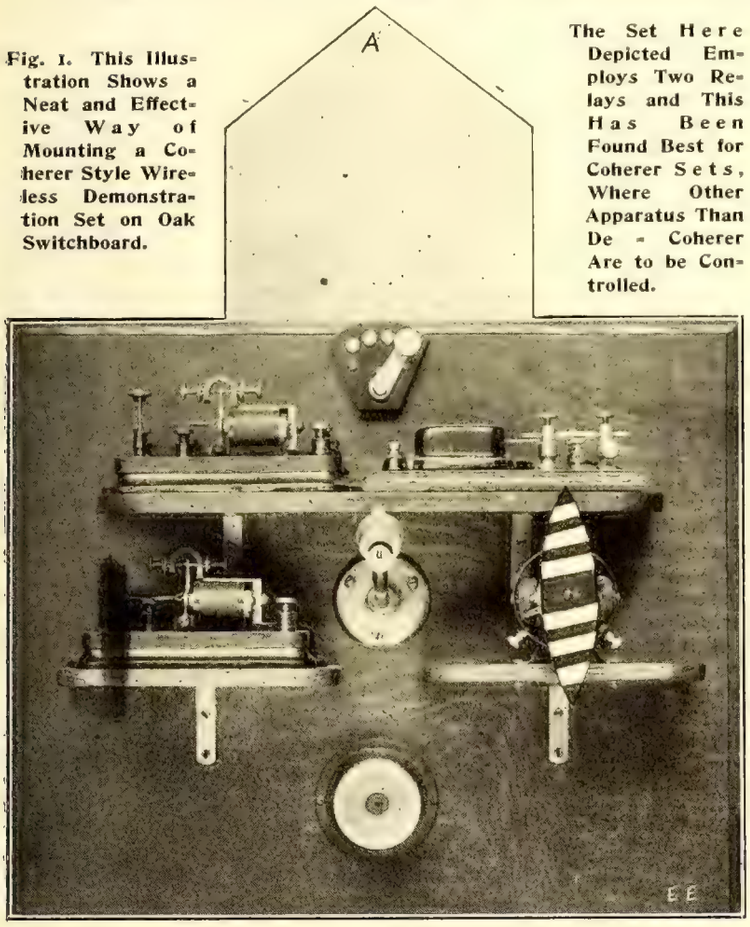


Fig. 1. This Illustration Shows a Neat and Effective Way of Mounting a Coherer Style Wireless Demonstration Set on Oak Switchboard.

The Set Here Depicted Employs Two Relays and This Has Been Found Best for Coherer Sets, Where Other Apparatus Than De - Coherer Are to be Controlled.

Fig. 1 shows a photograph of such a set, which works very nicely indeed. This is a good way in which to mount the various apparatus so as to be clearly seen by the audience; a couple of small shelves serve to support the instruments, as will be observed.

Referring to the diagram of connections for this outfit at Fig. 2, the general operation and arrangement of the set will be more clearly understood. A metal plate, which also shows in Fig. 1, and made of copper or aluminum, is indicated at "A." This plate may be about 12 inches square and any thickness.

The filings coherer "C" is tapped or decohered by the vibrating bell mechanism "D." Not more than one dry cell at "B1" should be connected in circuit with relay "R1" and the coherer.

It has been found best for such sets to use a second relay "R2" with which to control various demonstrative apparatus, such as electric whistle, lamps, motors, etc. These devices will be observed on the panel in Fig. 1, and the motor has a piece of metal fastened to the shaft so that its movement will be quickly and easily discerned. It is also a very good idea to mark some white bands on the strip of metal fastened to the motor shaft, so that its movement will be more quickly noticed.

The relays for this set are simply those known as "pony" telegraph type, etc., and while for short distances up to 50 to 75 feet it is not necessary to use any ground capacity "G" (corresponding in size to the metal plate "A" previously mentioned), this capacity should be used as shown in dotted line at Fig. 2 for greater distances than those mentioned. For distances above 150 to 200 feet it is best to use 10-15-foot brass tubes, etc., or a small aerial made of copper wire, etc., with a metal plate several feet square for the ground capacity or counterpoise. These sets, of course, should be operated, whenever possible, without any ground connection, as audiences in general are very skeptical on these matters, and if they find or see a direct ground connection they immediately believe that the apparatus is a fake.

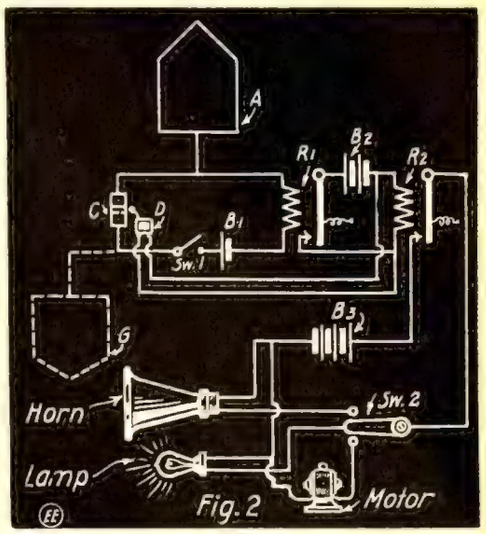


Fig. 2. Diagram of Coherer Set Connections.

A 1-inch spark coil proves very good for the transmitter, and this is usually mounted on a 5 or 6-foot pole with batteries, so as to be carried through the audience, allowing anyone to press the push-button actuating the coil. A ball spark gap should always be used for these lecture sets. For an aerial a 3-foot brass tube may project above the coil and connect to one side of the spark gap. Two such tubes at right angles act well as "aerial" and "ground," connecting each to alternate sides of the spark gap.

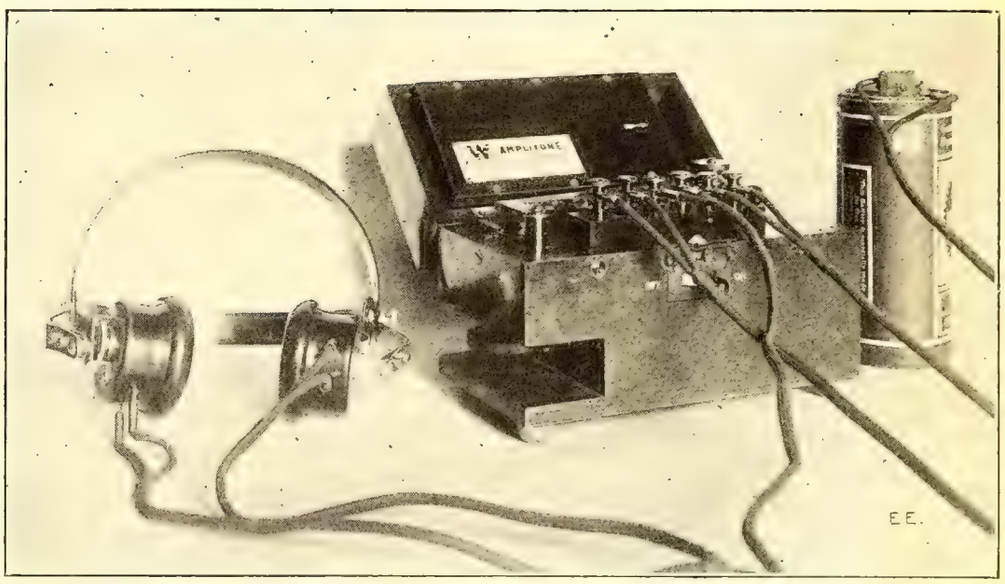
WIRELESS FROM NEW YORK TO BELMAR.

Randolph Miller, Edward Taylor and Frank E. Hoyer, all of Asbury Park, were appointed recently by Justice Kalisch, of the Supreme Court, as condemnation commissioners to fix the price of land wanted in Belmar, N. J., by the Marconi Telegraph Cable Co. for the establishment of a wireless station.

Application for the commissioners was made by John L. Grigg, president of the Marconi Co. The company's main station is at New Brunswick, and the justice was told that it was desired to establish wireless communication between Belmar and New York.

A MICROPHONIC RADIO-AMPLIFONE.

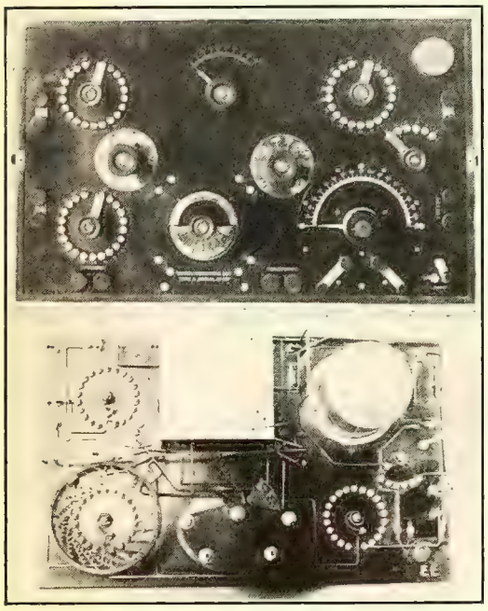
A new wireless amplifone for the amplification of received radio signals is herewith illustrated. This instrument was developed by a well-known American wireless company and it is extensively used in the United States navy and army. The principle upon which this amplifone works is that of the microphonic contact. There are within the box several microphones of special design and each one is connected in series with the next. The instrument is connected to the radio receiving set in place of the regular telephone receivers, and a battery is connected in series with the pair of phones and the microphones as shown. Each microphone amplifies the incoming signal with a different amplification strength until the last microphone stage amplifies it very considerably. By using more microphones the stronger the received signals will be amplified.



Standard Navy Type Amplifone Employing Extra Sensitive Microphones.

NEW U. S. NAVY RADIO RECEIVING SET.

Dr. Louis Cohen, of the Bureau of Standards, has recently perfected a new radio receiving set which has been adopted by the United States Navy as its standard receiving set. It is illustrated in Fig. 1.



(Above:) Fig. 1. Shows Front View of U. S. Navy Radio Receptor.
(Below:) Fig. 2. Rear View of Same.

The rear view is shown in Fig. 2. The connection of each individual instrument is represented in diagram Fig. 3, where A, C_1, L_1, constitute the primary or antenna circuit and C_2, L_2 constitute the secondary circuit. The two circuits are electrically linked together through two small condensers C_o, C_o, and any degree of coupling may be obtained by varying these condensers. This method of coupling offers several advantages. They are: (1) Compactness; (2) increased efficiency; (3) higher selectivity; (4) simplicity in operation. In regard to the first point it is quite obvious that by eliminating the receiving transformer, or loose coupler, a considerable economy in space may be accomplished, which makes it possible to build a receiving set of comparatively small dimensions for a large range in wave lengths. The second and third points have been definitely settled by a large number of comparative tests with other receivers of the best known types on the market.

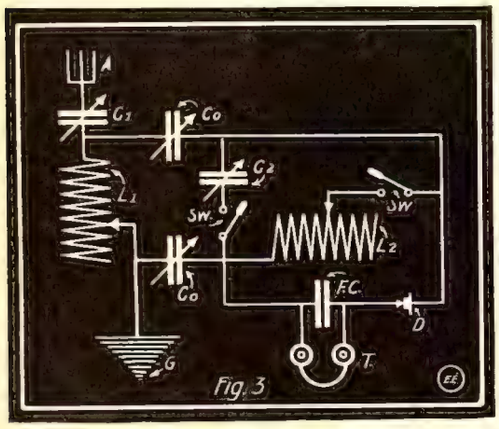


Fig. 3. Diagram of Dr. Cohen's Improved Navy Type Receiving Set.

The instruments are mounted on a hard rubber board and are connected by stranded copper wires. Note that all the wires are placed as nearly at right angles as possible. This was done in order to prevent cross induction, which may occur. Any wave length from 150 meters to 4,000 meters can be obtained quickly with this receiving set.

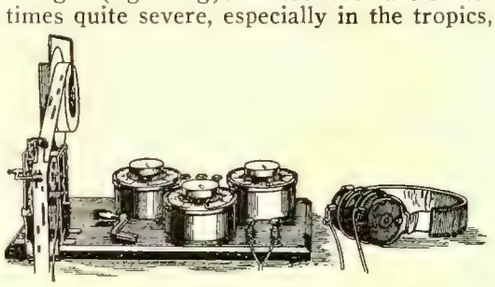
Dr. Louis Cohen has done a considerable amount of work in tabulating formulae for the determination mathematically of inductance and capacity values, and his latest product in the form of an efficient radio set will undoubtedly be very extensively applied.

All of the coils and other parts, such as condensers, are calibrated in their correct electrical values, and the finish and workmanship are of the very highest standard.

A NEW WIRELESS CODE TEACHER.

An improved form of automatic wireless code teaching machine, known as the Raydeograph, has been perfected, which does not use buzzers or vibrators. The device is here illustrated and appears of great value in all-around teaching where students have no access to schools, etc. It is also used in schools.

It quite often happens, in wireless, that an operator is compelled to copy one station through the "jamming" or signals of a second station, in which case two signals are heard in the telephones at the same time. After considerable practise an operator can concentrate his mind on one signal and disregard the other. These aerographic conditions are produced by the double tapes provided with the Raydeograph to perfection, with the additional advantage that the intensity of the individual signals can be varied at will. The student may manipulate the controls so that the "jamming" signal is much weaker than the one he is copying, but as he becomes more proficient in the art of copying through interference he may increase the intensity of the "jamming" signal or decrease that of the one he is copying. Now, by copying first one series of characters through the "jamming" of the other series, then *vice versa*, it will be seen that each tape contains four code lessons. Another novel and decidedly practical Raydeograph feature is the Static Producer. It should first be explained that "static" or "x's" are false signals or an etherial disturbance caused by the effect of atmospheric electrical discharges (lightning). These "x's" are sometimes quite severe, especially in the tropics,



Improved Form of Radio Code Teacher.

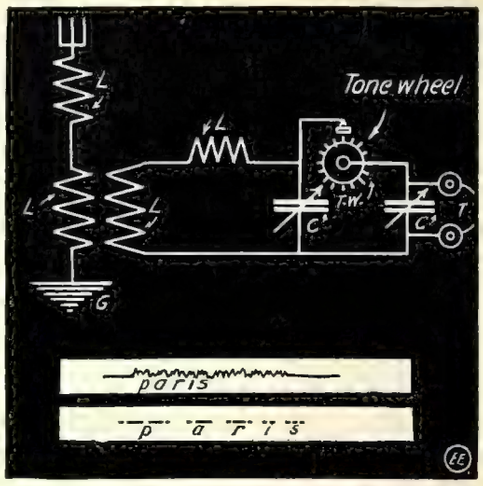
and it is often necessary for an operator to copy a station or signals through this interference. The Static Producer causes disturbances in the telephones identical with these X's, and by manipulating the rear left Raydeograph control the intensity of this interference is varied.

While in use at the Amherst Branch of the Nova Scotia Technical Schools this instrument has operated successfully with 27 telephones in circuit. The machine is contained on a base 8x13 inches and may be mounted on a small table or desk.

The D. L. & W. R. R. recently conducted successful wireless telephone tests between a moving train and station set, over a range of 63 miles, in mountainous country. Regular business made up the messages.

THE GOLDSCHMIDT TONE WHEEL DETECTOR.

One of the cleverest and also simplest radio detectors, if so we may call it, used for the reception of undamped wireless waves is that known as the "Goldschmidt Tone Wheel." We show illustrations herewith (see Fig. 1) of this ingenious device, which consists of a metal disc with a large number of teeth cut in its outer periphery



(Above:) Fig. 2. Circuits Used With "Tone Wheel."
(Below:) Fig. 3. Tape Records of Radio Signals.

and a finely adjustable brush making contact with the edge of the rapidly rotating disc.

The operation of this device is as follows: A special motor drives the toothed disc at such a speed that, considering the number of teeth and the revolutions per second, the number of breaks in the circuit per second will be slightly lower or higher than the frequency in cycles per second of the incoming etheric wave.

Suppose, for instance, that the currents to be received have a frequency of 40,000 cycles per second. Then, if each tooth of the tone wheel has a width of 1 millimeter, there will be a synchronous rotation for a circumferential velocity of 40,000 times 1 millimeter or 40 meter-seconds.

Owing to the difficulties of producing a constantly synchronous rotation it has been arranged for the wheel to rotate at a slightly different value than the frequency of the incoming wave. As an example, a frequency of 39,000 or 41,000 could be used for a wave frequency of 40,000 cycles.

Then the frequency of the "note" heard in the telephone receiver in the circuit, shown at Fig. 2, would be what we might

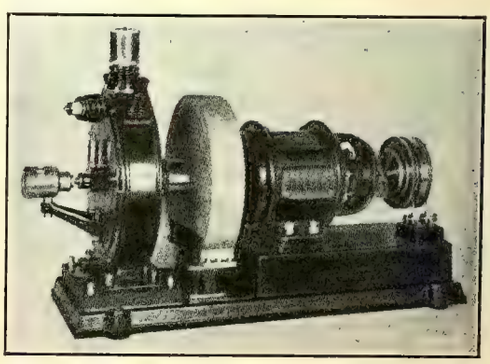


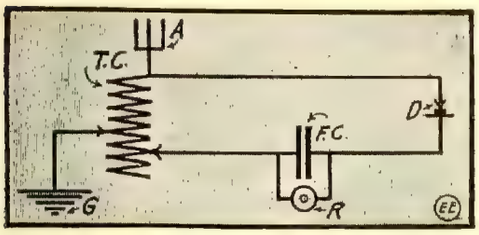
Fig. 1. The "Tone Wheel" is Driven by an Electric Motor at High Speed.

term for convenience the "beat" frequency, or the difference between, for instance, 40,000 and 39,000, or 1,000. Thus a perfectly audible tone is produced from a radio-frequency current which, of course, is far above audibility.

(*Continued on page* 109.)

A VACATION WIRELESS RECEIVING SET.

No doubt many of the wireless experimenters are about to go to the country on their vacations and they need not part with their instruments, as quite a compact receiving set can be readily made suitable for carrying about the same as a camera.

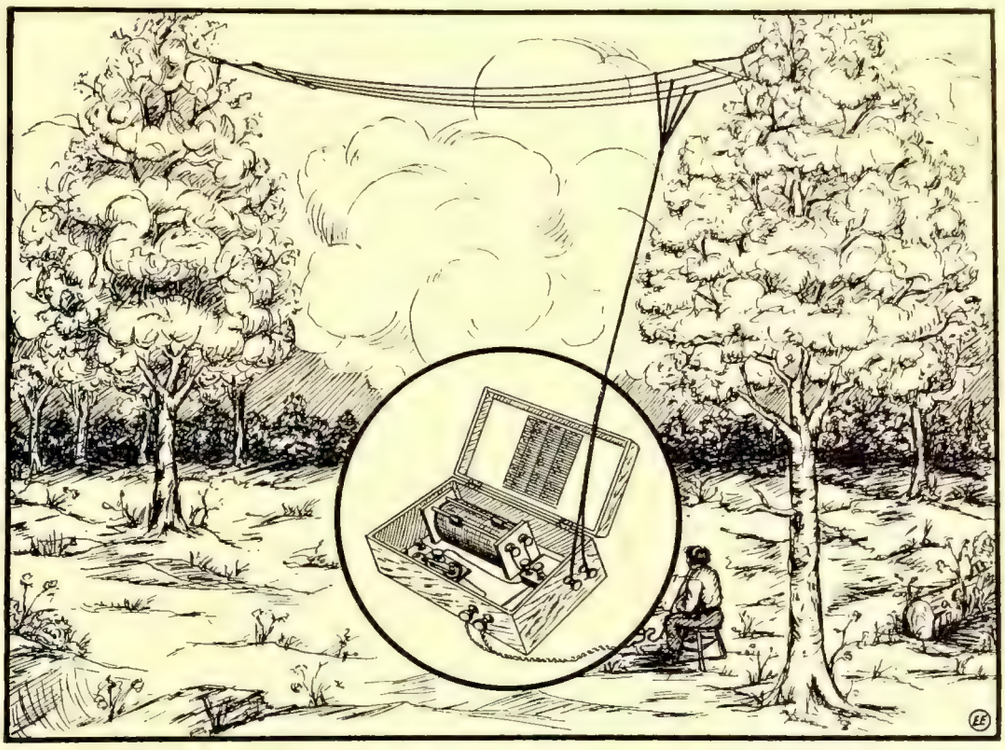


Circuit For Vacation Radio Set.

The case in which the instruments are placed is an ordinary hand valise, that can be obtained for about 50 cents, or a box of similar size. The instruments which comprise this set are an ordinary single slide tuning coil TC, a silicon detector D, fixed condenser FC, and a pair of 'phones R, of 2,000 ohms resistance, preferably. The tuning coil is fastened to the case by means of three screws, as shown. The detector and condenser are also fastened in the same manner. After the instruments are arranged connect them as in diagram.

The aerial or antenna should next be considered. There are several methods of erecting an aerial for temporary operations. One of these consists of flying a kite and attaching the aerial, in the form of a thin copper lead, such as No. 28 or 30 B. & S. gauge, to the kite string. Trees form good support for aerials. Sketch shows a method of supporting an aerial from a tree. Care should be taken to see that the wires do not touch any leaves or any part of the tree. The ground or earth connection can be made to any metallic body well grounded in moist earth, or a piece of pipe driven into the ground. If water pipes are available they should be used.

In using the set the detector is first adjusted until signals are received best, but a buzzer test is of course the quickest way to adjust it, and therefore it is advisable to install a buzzer test on this outfit. This set will be very useful to the experimenter in obtaining the latest baseball and other news and correct time signals, et cetera.



How Aerial May Be Erected Between Two Trees for Receiving Wireless Messages.

THE GOLDSCHMIDT TONE WHEEL DETECTOR.

(*Continued from page* 108.)

If a suitable high-frequency A. C. galvanometer is placed in series with the tone-wheel circuit very excellent tape records may be taken of the dots and dashes, as Fig. 3 shows. These were registered photographically on a moving film.

TALK BY WIRELESS PHONE 721 MILES.

Sponsored unofficially by the Secretary of the Navy, a wireless telephone invented by H. P. Dwyer, a San Francisco man, has carried the human voice 721 miles. The conversation was exchanged between the United States Government radio station at Mare Island and the Government station at Tatoosh, Cape Flattery, on the coast of Washington.

During the test Mr. Dwyer's voice was also heard at Bremerton, a distance of 560 miles; at Point Arguello, at Eureko and by the Government radio operator at San Diego.

The call sent from Mare Island was received on wireless telegraph sets, and the replies were telegraphed back. Through the perfection of certain parts of the new invention Dwyer says that it is possible to telephone in any kind of weather.

Mr. Dwyer asserts that he could have been heard at 1,000 miles if there had been a radio station to receive his message, and that with the proper aerial, 500 to 600 feet high, there is no reason why the human voice cannot be distinctly audible from San Francisco to Honolulu.

A round magnet coil contains the least resistance with a given core cross-sectional area.

The upper curve in Fig. 3 shows a record produced by means of an ordinary crystal detector, and the lower record shows the remarkable clearness of the signals registered with the tone-wheel receptor.

Although this machine has been repeatedly classed with that invented by Prof. R. A. Fessenden, known as the "Heterodyne," it does not operate on the same principle at all, as will be evident.

This tone wheel simply acts as a frequency changer, while the Heterodyne produces its results by the amplification due to superimposing a high-frequency alternating current on the radio-circuit, and "beats" are thus produced of low frequency which depend upon the difference between the frequency of the etheric wave and the superimposed artificial wave. No such beats are produced in the Goldschmidt device.

BLOWING UP A TOY BOAT BY WIRELESS.

Here is a new and exciting sport for boys who know a little about electricity, especially for boys who have wireless apparatus. It was devised by Prof. Charles Forbes, of Columbia University, to prove that a submarine bomb cannot be exploded by wireless waves except through a special apparatus, says the *Sunday World*. With such apparatus, which is easily made at home, you can explode bombs under toy ships floating in the bathtub or a washbowl

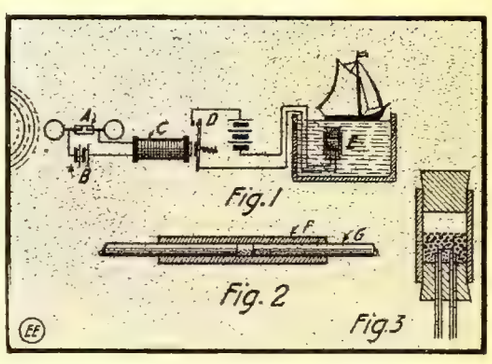
At Fig. 1 is shown a diagram of the apparatus for exploding a mine by wireless. A, coherer; B, primary batteries; C, relay; D, batteries of the relay; E, vessel of water containing miniature mine.

Anyone who has not a wireless apparatus can make use of an induction coil or a Leyden jar for producing the waves. A Branly tube arranged in series with two or three dry batteries will form the receiving apparatus, and this is completed with a relay from which wires run to the fuse of the mine.

The electric waves, whether real wireless or discharged from a Leyden jar, act upon the coherer, the battery of which closes the relay circuit. The coherer is made of a glass tube about 1½ inches long, into each end of which a rod of copper or brass is introduced. Between the ends of the rods there should be a space about $\frac{1}{16}$ inch long filled with filings (nine parts nickel and one part silver). Metal balls are fitted to the other ends of the rods. Such a coherer offers great resistance to the passage of the current from the battery, but the wireless waves greatly increase the conductivity of the filings, and this is enough to set the relay in action.

Fig. 2 shows details of the coherer; F, glass tube; GG, copper rods, and Fig. 3 the miniature submarine mine.

The mine is made as indicated in diagram Fig. 3. It is a metal tube about three-quarters of an inch long, closed at each end with a rubber cork and the space inside loaded with ordinary gunpowder. Through the lower cork the insulated wires from the relay battery are inserted, and



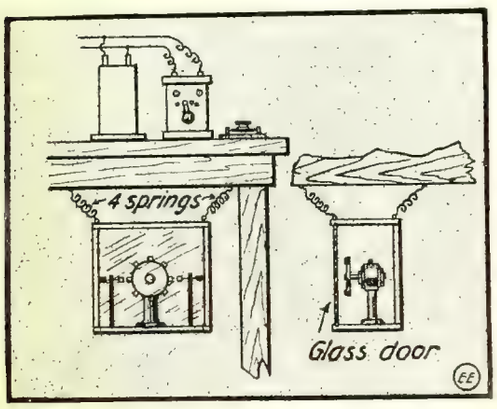
Wireless Method of Blowing Up Miniature Ship.

(*Continued on page* 110.)

MOUNTING SPARK GAPS TO ELIMINATE NOISE.

A very novel and at the same time effective method of mounting or, rather, suspending a rotary spark gap, has been made use of by a New York radio experimenter.

As the illustration shows quite clearly, the rotary gap with its motor is mounted in a substantial wooden cabinet with glass



Spark Gap Noiselessly Suspended on Springs.

front and this cabinet is suspended on four strong spiral springs from the underside of the operating table.

The glass door on the cabinet should close tightly and, owing to the method of suspension used, practically no vibration noises are transmitted beyond the wireless room.

BLOWING UP A TOY BOAT BY WIRELESS.

(*Continued from page* 109.)

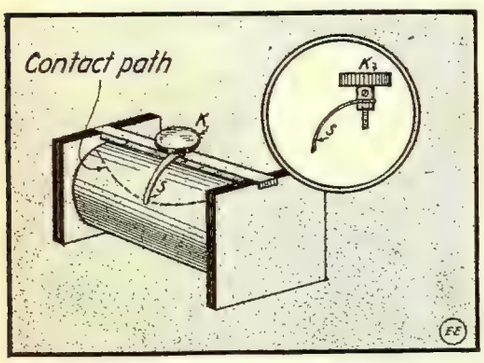
their ends are joined by a very fine wire of iron or platinum. This rests in the middle of the powder. As soon as the current passes through it becomes red hot and the powder explodes.

The mine is placed in the bathtub and a toy boat is sent sailing over it. At the right moment the Leyden jar is discharged, the coherer catches the waves of electricity, closing the main circuit; this actuates the relay, which sends the current of its batteries into the mine. This explodes and blows up the toy boat.

Such mines can, of course, be exploded by direct current from a battery, the circuit being completed with a telegraph key corresponding to harbor mines fired by electricity.

A ROTARY TUNING COIL SLIDER.

In the accompanying sketch is shown a



Simple Tuning Coil Slider.

type of rotary slider that can be used advantageously on tuning coils of average length and diameter. In the center of the slider bar of the tuning coil bore a hole of suitable diameter to pass an 8-32 machine screw. Then take a piece of 1-32x½-inch spring brass S about half the length of the tuning coil, and at one end of the spring bore a hole in order to secure it to the slider bar and knob K. With a little adjustment it will be found possible to have the end of the contact spring follow the circular path on the coil as indicated.

Contributed by

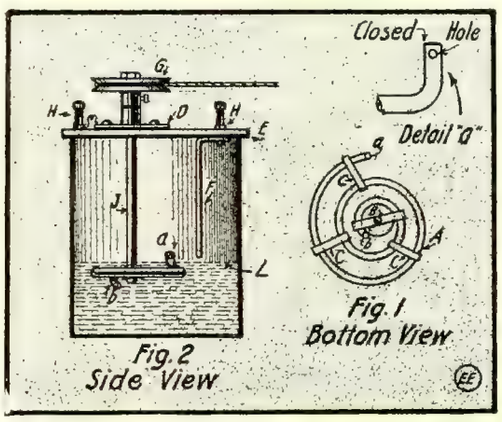
CHARLES F. ENGLER.

CONSTRUCTION OF A MERCURY TURBINE INTERRUPTER.

The main drawback in the construction and operation of spark coils is the interrupter. The interrupter here described is of the mercury turbine type, which can be used for very large spark coils.

The first thing to be made is the spiral tube A, Fig. 1. This is made of one-quarter inch brass tubing having a small internal diameter. It is then bent into a spiral as shown. This is readily done by placing the tube in a fire and then bending it to the required form. The ends (a) and (b), Fig. 2, are next bent as shown. The lower bend is used to suck the mercury in, while the upper bend is used to force the mercury out of. A round brass disc and a shaft are next made. The disc B is made 2 inches in diameter and ¼ inch thick. A ¼-inch shaft hole is drilled at the center. A ¼-inch brass shaft rod J is then inserted tightly in the disc. The spiral should next be placed on the disc and mechanically fastened (but not soldered) around as shown. Three brass strips C are secured around the spiral in order to strengthen the whole.

After these parts are completed the spiral is placed into a glass container. The spiral and shaft are supported by a brass collar D, Fig. 2, which is fastened by means of wood screws onto the cover E. A second contact F is next made, which consists of a brass sheet 1 inch wide. The segment F can be of different widths to give dif-



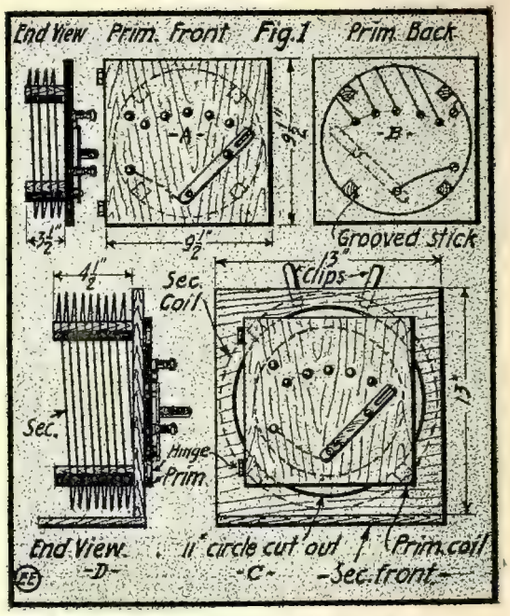
A Mercury Turbine Interrupter.

ferent results; so several of them should be made up.

The container is next filled with metallic mercury up to level L, and the shaft is rotated by means of a motor connected to the pulley G. The spark coil is connected in series with the source of power and the mercury interrupter from binding posts H H. When this interrupter is properly built it will interrupt the primary circuit between 300 and 2,000 interruptions per minute, depending upon the speed that the spiral is revolving at. The usual primary condenser is connected across the posts H H, and is best of the adjustable type for good results, especially when different width segments are used. The mercury will combine with solder, so the spiral must be mechanically braced or else brazed with *brass* solder.

A PROF. MODEL OSCILLATION TRANSFORMER.

A very efficient oscillation transformer may be made in the following manner. By a close study of the diagrams a good idea of its construction may be obtained.



Efficient Form of Oscillation Transformer.

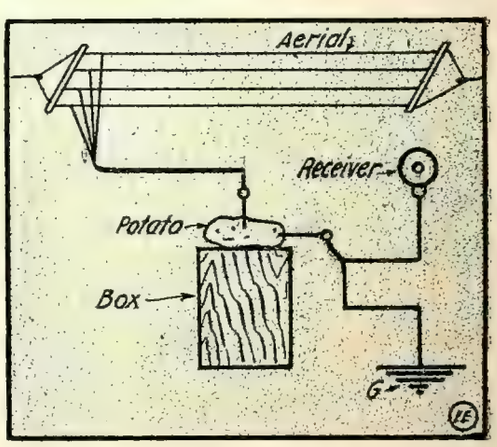
The base and other wooden parts should be made from good dry oak or other hard wood. The primary (Fig. 1) is wound with five turns of No. 6 aluminum helix wire with half-inch spacing. Each turn is tapped and brought to a five-point switch on the front (Fig. 1a) so that the wave length can easily be regulated.

The secondary is wound with eight turns of No. 6 or No. 8 aluminum wire, spaced about one-half inch, and is adjusted by two clips (see Fig. 1c).

Submitted by PAUL FLEHR.

A POTATO DETECTOR.

While putting up an aerial in my yard (80 feet long and 60 feet high) recently I tried to receive wireless messages. I took a potato and placed it on a box. Then I took two sewing needles. I took one needle and stuck it into one side of the potato. I then connected the second needle with one pole of the receiver and stuck it in the other end of the potato. I took the ground wire and connected it with the other end of the pole of the receiver, and when this was



A Potato Acts As Wireless Detector.

completed I was able to receive many messages just as clearly as from a detector.

Contributed by

MILTON ROCHKIND.

(An electrolytic action, no doubt.—*Editor.*)

HOW-TO-MAKE-IT DEPARTMENT

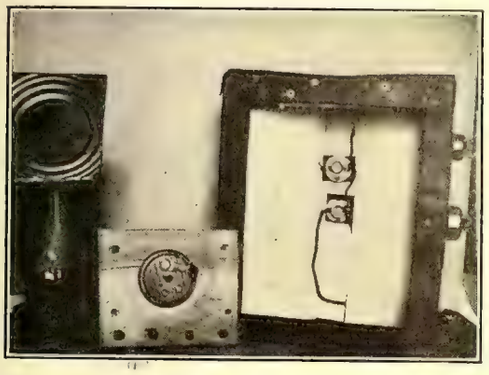
This department will award the following monthly prices: FIRST PRIZE $3.00; SECOND PRIZE $2.00; THIRD PRIZE, $1.00.
The idea of this department is to accomplish new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department, a monthly series of prizes will be awarded. For the best ideas submitted a prize of $3.00 will be given; for the second best idea a $2.00 prize, and for the third best a prize of $1.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings.

SECOND PRIZE $2.00.

AN IDEAL ELECTRIC RUBY LAMP.

The lighting system which I am sending herewith is one I have in use at the present time and I would never be without it.

My first experiment was with an old oil ruby lamp converted into an electric lamp,

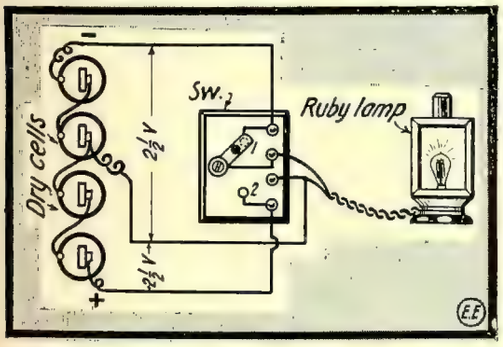


Electric Ruby Lamps For the Amateur Photographer.

as I have illustrated in drawing. In this drawing will be seen a two-point switch, mounted on a small board having four binding posts, for making quick connections.

With the aid of this board I have used four dry cells for almost a year by simply throwing the switch from one point to the other, whenever I think of it while in the dark room, which allows two cells to rest while the other two are working. This should be a great relief to any amateur photographer, and can be used also where continuous service is required, when dry batteries only are at hand.

At present I am using a lamp which I have made of a soap box of suitable size for holding an 8x10 ruby glass, in which I have two miniature lamps, and two snap switches on outside of box, one for each lamp, so that if one lamp should happen to burn out while at work I can use the other; or I can use both, if desired. The switchboard can be attached to back of lamp box if necessary. Many an amateur dreads the work in a dark room, especially



Wiring of Dry Batteries for Ruby Lamp.

in hot weather, with the oil lamp, which adds to his discomfort.

Contributed by VICTOR A. SCHYE.

L. John Block of Cincinnati, Ohio, writes as follows:

"I must say the *'Electrical Experimenter'* is some Magazine. The best ever in my opinion."

FIRST PRIZE $3.00.

SIMPLE ELECTRIC DRAWER-LOCK AND TELL-TALE SIGNAL.

The following is the description of an electric lock and tell-tale signal which I constructed for use in my workshop and have used for some time.

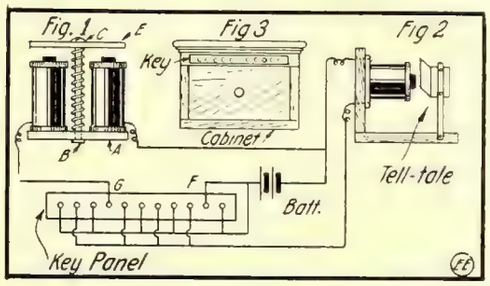
Looking at Fig. 1, A represents two magnets (I used some from bells) with the yoke drilled at B for a 1½x⅜-inch roundhead stove bolt C, which is fastened at bottom side of magnet by a nut.

A light spring D with the nut at top of bolt holds a piece of ⅛-inch iron E away from magnets until the current magnetizes and draws the iron down, thereby unlocking the drawer.

Having finished the lock, we may now turn our attention to the key, or secret switch, which unlocks the drawer. On the top part of the drawer place a thin strip of wood with brass upholstery tacks mounted and wired as shown.

By looking at the diagram it will be seen that in order to open the drawer a connection has got to be made between F and G, as all other wires connect with the tell-tale signal shown in Fig. 2.

This is merely a single magnet mounted on a strip of wood with a small piece of



Magnetic Lock and Tell-tale for Drawers.

light iron mounted on a stick which is hinged on the bottom so that the current will draw the iron strip onto the magnet. This magnet I have enclosed, together with two dry cells, in a box and placed behind the cabinet so that if a stranger opened the drawer he could not reset the signal.

This device has given excellent service, besides saving me the price of an expensive lock and, although it has been in use for a long time, both signal and lock are in good condition. Contributed by

GEORGE H. ROBERTS.

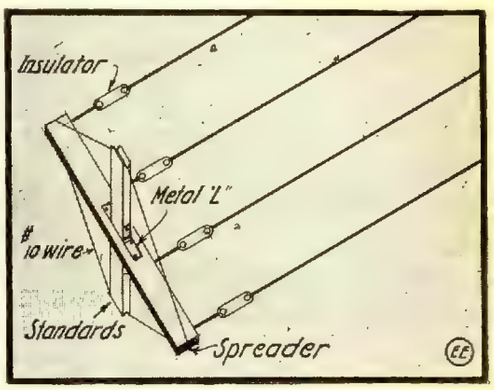
STATIC ELECTRICITY FROM SUIT CASE.

I thought I would tell you of a strange experiment in static electricity I have made accidentally. I have a leather suit case which I carry around daily. I have noticed while walking, if I brought my finger close to the suit case brass lock I felt a slight twinge. For a long while I wondered what the cause of this was. Finally I arrived at the conclusion that the suit case continually rubbing against my woolen coat caused a charge of static electricity, which stored itself in the lock. Then when the finger was brought close to the lock it discharged itself into the body, and thence into the ground. E. CAPILLON.

THIRD PRIZE $1.00.

BRACE FOR AERIAL SPREADERS.

The illustration shows the method I use to prevent my 12-foot spreaders from warping. Two wooden standards one foot long are screwed to the center of the spreader, over which is drawn a No. 10



Aerial Spreader Strengthening.

copper wire. I have been using such an arrangement for a year with perfect satisfaction.

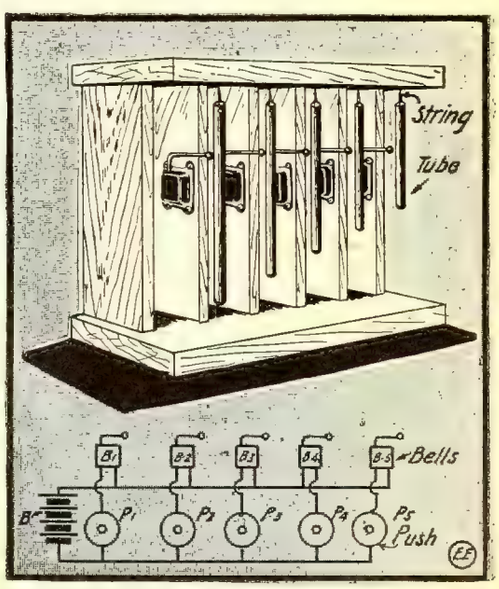
Contributed by

ARTHUR R. DARLING.

A SIMPLE ELECTRIC CHIME.

A simple but harmonic electric chime can be made by anyone. The following material will be needed in constructing this simple chime: Two pieces of oak, 12x5x¾ inches; 10 strips of white wood, 8x2x½ inches; 10 electric bells, with gongs removed; 10 pushbuttons, 10 brass tubes, ¾-inch in diameter; the largest tube should be 7 inches long and the smallest tube 2 inches long, while the other tubes should vary in ½-inch lengths.

Arrange the apparatus as shown in figure.



An Electric Chime.

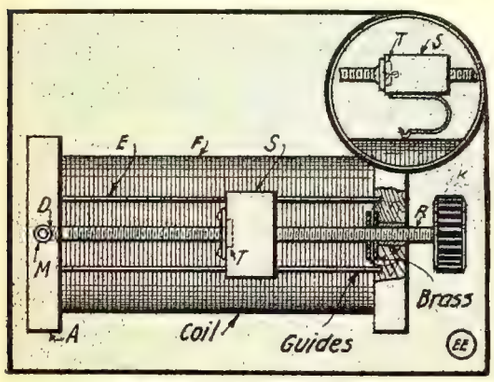
Care should be taken to allow the brass tubes to swing freely, as the tone of the tubes depends upon the vibrations received from the striking of the clapper. The connections are shown in sketch. The tubes are best hung on strings.

A PRECISION TUNING INDUCTANCE.

When it is desired to tune finely a certain circuit the knob K is turned, and also the threaded rod turns. Because it is fixed and cannot move, the nut T (and consequently the slider S) is moved up and down the coil at will. It is recommended that as coarse a pitch or spiral as possible be used, of the type used in automatic drills, etc. Thus the maximum of movement of the slider is obtained by minimum movement of the knob.

The rod R, being pivoted in D, makes contact therewith. The bolt M of binding post completes the connection.

A double or triple slide coil may be operated in this manner by reducing the di-



Finely Adjustable Tuning Coil.

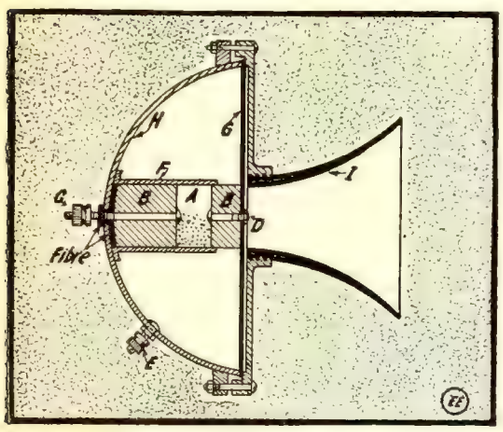
mensions (diameter) of rods R and E E, and of slider S.

The whole coil may be enclosed by thin wooden sides. It then presents a very neat appearance. No iron should be used in the construction of this tuner. Contributed by

A. D. R. FRASER.

MAKING A TELEPHONE TRANSMITTER.

The diagram shows how I made a simple telephone transmitter. H, the case, is a gong from an old bell; B. B are two pieces of carbon cut from an old battery, each having a hole in the center; F is a paper tube to hold the crushed carbon or better regular carbon granules A. D is a binding



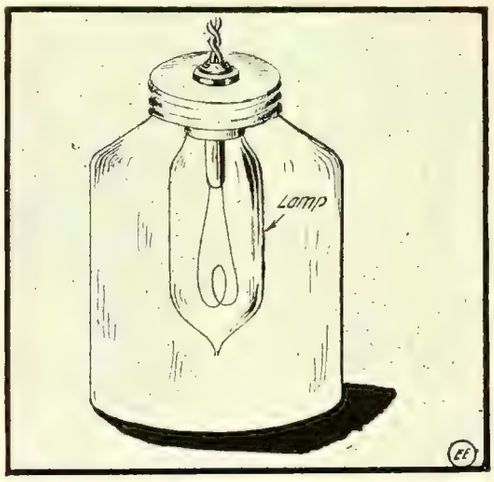
Microphone Made Out of Bell Gong.

post to hold the carbon button to the diaphragm G, which is made of tin or ferrotype iron cut to the right size and held by a wooden ring as indicated. At C is a binding post holding the button B to the back of the gong, from which the button and post are carefully insulated. E designates a binding post attached directly to the gong and forms the other connection for the circuit. I is the mouthpiece. The diagram is self-explanatory.

Contributed by ALLEN SJOHOLM.

A RUGGED DARK-ROOM LAMP.

Procure an ordinary two-quart glass fruit jar, break out the porcelain lining in the cover and cut a hole through the metal just large enough to fit over the socket as shown. Then solder cover and socket to-



Dark Room Ruby Lamp in a Bottle. Hard to Upset.

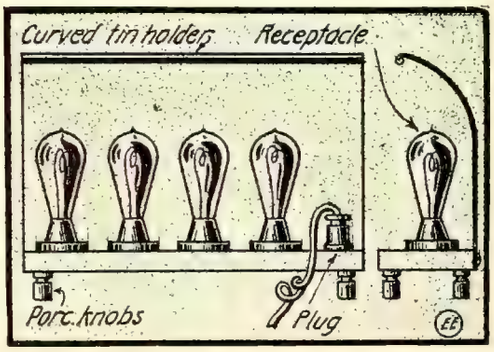
gether. Line the inside of the jar with two thicknesses of orange paper. One can almost use an 8-C. P. lamp, but the best is a 4-C. P. lamp. Screw the lamp into the socket and turn the cover onto the jar. With cord and plug of proper length the light can be readily moved where needed about the dark-room table.

HOW TO MAKE AN ELECTRIC HEATER.

Everyone appreciates the grateful heat and cheerful glow of the luminous electric heater or the modern open fire. It is very useful wherever a small amount of heat is desired quickly. The home-made electric heater here described is especially desirable for the sickroom, nursery and cozy corners.

Procure about 4 to 5 porcelain lamp receptacles and mount these on a hardwood base. When you mount the receptacles remember that the width between them should be large enough to allow the lamp bulbs to be screwed in and out without trouble.

Connect receptacles in parallel as shown in drawing. The last socket is left without a lamp, as this one will receive the plug. The other end of the cord has also a plug for current connection. When all is finished so far, make from sheet tin or polished copper a hood as shown in drawing. The purpose of this hood is to reflect the heat which the lamps develop. The amount of heat can be varied by using higher candle-power lamps and the heat can also be regulated by partly unscrewing some of the lamps. The more lamps there are on,



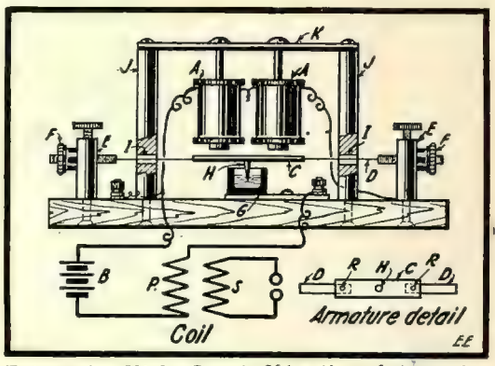
Electric Lamp Stove For the Chilly Evenings.

the more heat, and vice versa. Porcelain knobs are best screwed under the base to act as feet in supporting the heater above the floor. If the most cheerful effect is desired frosted globes can be employed.

MAKING A HIGH SPEED INTERRUPTER.

In the accompanying drawing is shown an interrupter for producing extra high frequencies. This interrupter when properly made will interrupt circuits from 50 to 600 periods per second.

At A A are two magnets taken from an old electric bell which are supported on an iron yoke K, as shown. C is the armature, made from a piece of soft iron about No. 20 gauge. An ordinary steel pin H is riveted to the center of this armature. Two short pieces of brass spring D D are then riveted to the ends of the armature by two small rivets R R. The standards E E and J J are made of brass. Two holes I I are drilled through each standard J J. These holes are to be made large enough to let the brass springs D D vibrate freely. A

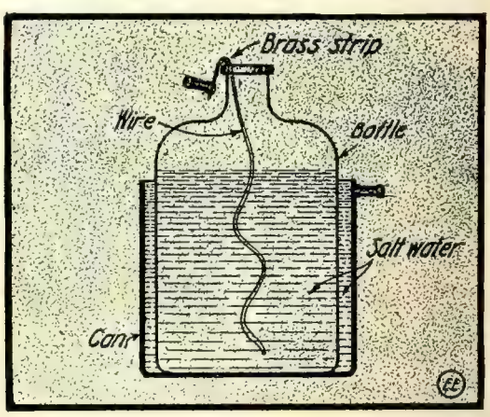


Extremely High Speed Vibrating Interrupter.

small brass cup is taken from an old battery and should be fastened to the base, as shown at G. Now fill the cup about three-quarters full of mercury and connect as indicated. Any frequency may be obtained just by varying the tension of the two springs D D. Two No. 8-32 screws slip through holes in posts E, having clamping screws. Fine tension adjustment is affected by thumb-nuts F. This interrupter works very good in connection with medical wireless coils or X-ray coils.

A CHEAP BUT EFFICIENT SENDING CONDENSER.

The parts needed for this condenser can be found in nearly every home. It consists of a tin can, a large bottle free from



Salt Water Type Leyden Jar.

flaws, two binding posts, wire and salt water. Little need be said, as the diagram speaks for itself. The salt water acts the same as the tinfoil in Leyden jars. With one of these condensers, a 1-inch coil and no helix, I get a very good spark.

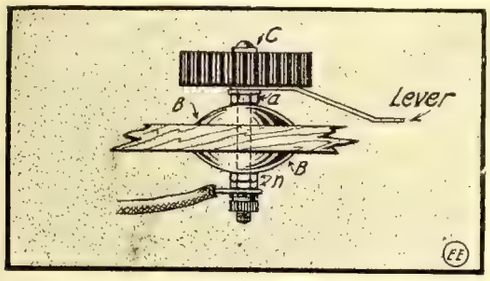
Contributed by RAY ATKINS.

A HOME-MADE SWITCH LEVER.

An efficient switch lever for use on loose couplers inductive tuners, etc., having a much neater appearance than the ordinary lever, can be constructed cheaply in the following manner:

A brass lever is cut from a piece of sheet brass 2" long, ½" wide at one end, ⅜" wide at the other; the narrow end is rounded slightly. A ⅛" hole is bored in the wide end.

The thumb screw is made from a black checker 1¼" in diameter; the plain side is turned up and a ⅛" hole bored in its center. A stove bolt 1⅜" long and ⅛" in diameter, threaded its entire length, is slipped through the checker and the brass lever secured firmly to the bottom of the checker by the nut "a," as shown in the



Switch Construction for Tuners, Etc.

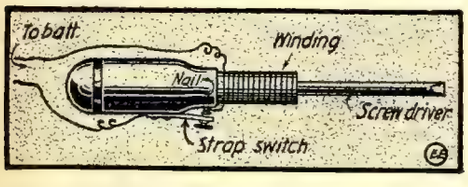
figure. A small washer had better be used, as shown at "c," to prevent the head of the bolt from pulling through the checker.

Two tin roofing caps "B," with ⅛" holes in their centers, are used to grip the surface tightly, of whatever they are attached to. Three nuts, "n,n,n," are now needed; one to tighten the bolt properly, the other for a check nut to hold the first, and the third to clamp the wire connection.

Contributed by
ARTHUR R. DARLING.

AN ELECTRO-MAGNETIC SCREW-DRIVER.

A magnetic screwdriver is very convenient in starting screws in places difficult to get at. The magnetic screwdriver herewith shown is simple to fit up. At first, wrap the steel shank with a layer of paper or tape and then wind evenly four layers of No. 24-gauge copper magnet wire,

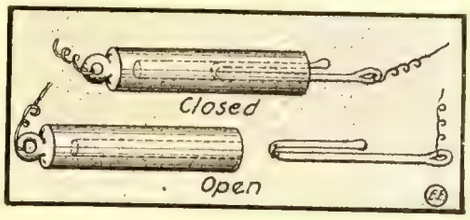


This Screwdriver Holds Screws on Its End by Magnetism.

which can be obtained in any electrical store. After the wire has been wound, make a strap key of brass or other conductive material. A small rubber knob is next placed on the end of the strap key as shown. This key is then fastened to the handle by means of brass screws. A small tack or flat-head screw is hammered on the handle in order to make the second contact. One of the wires from the coil of wire is connected to this tack, while the other wire is brought to the end of the handle. Another wire is connected to the strap key and both of these wires are braided together. These wires are taped to the handle with friction tape as shown. Every experimenter and electrician should have a screwdriver of this kind in his shop or laboratory tool kit, as a great deal of time is saved with it. The drawing is self-explanatory. A few dry cells will supply the necessary current required.

A HANDY ELECTRIC COUPLING.

A very useful electric coupling can be made from a clasp such as that used in fastening bead necklaces. They are generally made with a small ring on each half for fastening to the necklace, and the electric wire can be easily twisted around these rings. Also it is easy to make similar



Easily Made Electric Connector.

couplings for battery circuits on the style illustrated from a piece of brass tube and flat brass spring bent U shaped.

METHOD OF PREPARING LEAD PEROXIDE.

Carefully treat "red lead" with pure nitric acid ($H NO_3$). Collect the remaining substance when the acid has been poured off; wash it well and filter it carefully, drying until it is a thick paste. Now mould it into pellets in a piece of glass tube with a wooden rammer. Dry and place in detector stand. Contributed by
A. D. R. FRASER.

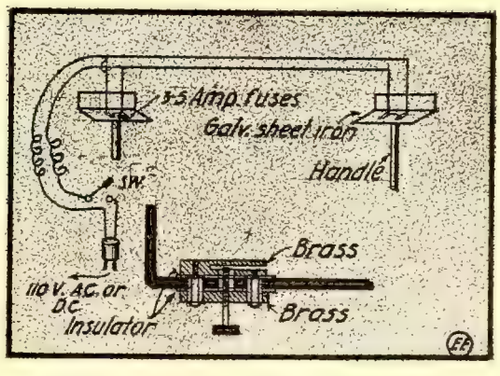
ELECTRICAL IGNITER FOR FLASHLIGHT.

As there are many photographers taking photographs where considerable quantities of flashlight powder is to be used, the following description of a very simple electric igniter may not be amiss:

As the sketch indicates, a right-angled sheet iron tray is mounted on a handle and in the center of the tray is placed two insulated brass clamps or contacts. These contacts are electrically connected to a piece of standard lamp cord, which may be joined by an attachment plug into any electric lamp socket.

Some small lead fuse wire of about 3 amperes capacity, or better, 1 ampere size, is spread across the small space, about 1 inch long, between the connection clamps.

When the current is turned on by a switch in the circuit or the key on the socket into which the cord terminal is



Electric Igniter for Photo Flash Powder.

plugged, the fuse wire is melted and ignites the flash powder.

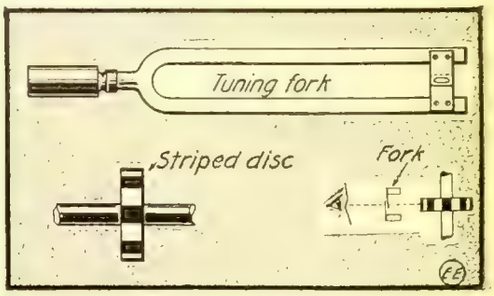
This arrangement has been used practically, with excellent results, by one of the largest commercial photographers in the country.

The New York-San Francisco telephone line is 3,390 miles long. There are two circuits, each using 6,780 miles of hard-drawn copper wire.

TUNING FORK AS SYNCHRONOSCOPE.

Probably one of the simplest ways of judging the synchronism of an A. C. induction motor, especially when the motor is of the synchronous type as used in talking picture machines, is here described.

This consists simply of a large tuning fork about 1 foot long, which is struck smartly on the hand, and at the two free ends of the fork two metal leaves pass each other in a vibratory manner. In these two leaves there are two slots about ⅜ inch long by 1/32 inch wide. To check the motor speed, which motor, by the way, has a rotating disc on the shaft painted alternately with black and white stripes about ½ inch wide, as shown in illustration, this



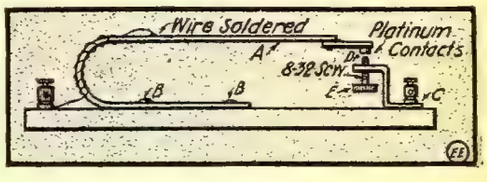
Tuning Fork Forms Simple Synchronoscope.

disc is viewed through the vibrating slits just mentioned. If the motor is in perfect synchronism with the A. C. supply and with the generator at the other end of the line, the stripes on the rotating disc appear to be stationary. If the motor is running faster than it should the disc appears to drift forward. If it is running too slow the rotating striped disc appears to move backward, or vice versa, depending upon the direction of rotation of the motor.

Of course the tuning fork used must be of the proper vibration note, corresponding to the frequency of the motor current, or rather the synchronous speed of the motor and the number of stripes on the disc. Any physics book gives these frequency equivalents.

A SIMPLE ELECTRIC FLASHER.

Here is a simple and cheap flasher for



A Thermostatic Electric Flasher.

use on battery circuits, for flashing small battery lamps or any other purpose that may suggest itself to the experimenter.

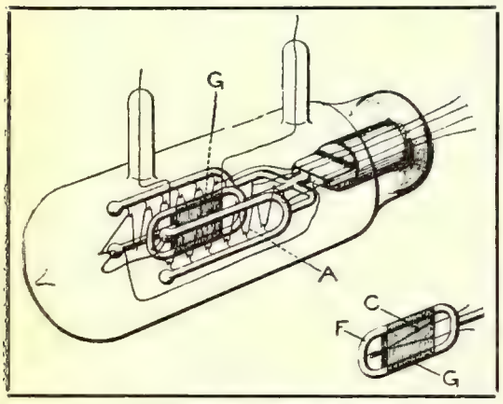
At A is a piece of steel ½x⅛x8 inches; B are two wood screws; C is a piece of brass; D, platinum contacts, and E, a set screw for adjusting this device. The winding is composed of about 8 feet of No. 36 single silk-covered wire. One end is connected to the binding post and the other end soldered to the spring, as shown.

When more than about 1½ amperes flow through the fine winding the latter heats up and causes the spring to bend so as to break the circuit at the contacts. When it cools off the spring straightens out again and closes the circuit.

This opening and closing action repeats itself every few seconds when the apparatus is properly adjusted. Different sizes of part A, and also the wire used, should be tried for various requirements until the best results are obtained.

PURE ELECTRON DISCHARGE FOR WIRELESS TELEGRAPHY AND TELEPHONY.

The electron emission from heated metals at very low pressure has been investigated by scientists for many years, and the observations have been generally explained to be the result of chemical reactions with slight traces of gas. In the first half of an article by Dr. Irving Langmuir, and which is arranged in the form of a historical review, are related the experiments leading to the conclusion of the existence of pure electron emission in even the highest attainable vacua. After outlining the fundamental principles which govern this phenomenon the author shows how, through the medium of the *kenotron* (a hot-filament vacuum rectifier) and the *pliotron* (a new type of amplifier), both of which employ the pure electron emission from heated metals in extremely high vacua, a very simple and successful equipment has been produced to send and receive radio-telegraphic and radio-telephonic messages by trigger control of the tube. As much as 2 k.w. can be controlled in this way by an ordinary microphone.



The New "Pliotron" Vacuum Bulb Rectifier For Wireless Work.

In the construction of *pliotrons* it has been found desirable to make the wires constituting the grid of as small cross-section as possible. In this way, even when a positive potential is applied to the grid, the current that flows to the grid may be made extremely small. The use of very fine wire is made possible by using a frame of glass, metal or other suitable material to support the grid. Thus, in figure, the filament G is mounted in the center of a frame made of glass rods, on which the fine grid wire is wound by means of a lathe. The grid may thus consist of tungsten wires of a diameter as small as 0.01 mm., and these may be spaced as close as 100 turns per centimeter, or even more. —*General Electric Review.*

SPEED OF WIRELESS.

A paper presented before the French Academy of Sciences on the speed of propagation of the waves used in wireless telegraphy over the surface of the earth. The method used is as follows: Station 1 emits a signal to which Station 2 replies by a second signal. In Station 1 the time T_1 is measured between the departure of the first signal and the arrival of the second, and in Station 2 the time T_2 is measured between the reception of the first and the emission of the second signal. The time $T_1 - T_2$ is the time of transmission of the first signal from 1 to 2 and of the return signal from 2 to 1. The time $T_1 - T_2$ are measured by means of photographic microgalvanometers. By this method it is possible to measure the interval of time with an absolute precision which may become 0.00001 second. The wireless-telegraph waves are propagated over the surface of the earth with a speed apparently slightly less than the speed of light.—*Electrical World.*

ELECTROLYTIC INSULATION OF ALUMINUM WIRE.

An interesting use of the oxide film always present on aluminum wire and methods of artificially building up this film, which serves as an electric insulator, is described by C. E. Skinner and L. W. Chubb.

Numerous kinds of electrolytic baths were tried by the authors of the paper, and considerable practical results obtained. The film insulation, even after being built up, as explained, is very thin, and thus a considerable saving in the space factor is possible.

In the subsequent development continuous methods were employed in which the wire as an anode was drawn through a bath of electrolyte. In all the earlier methods of treating the wire passed over several sheaves with the result that it became hardened in the process. A straight-through method, as shown in the figure, was, therefore, tried and found to give very satisfactory results. Five tanks arranged in a straight line were used. The first and last contained hot water for washing and the middle three electrolyte. The wire passed from tank to tank through glass tubes and the solutions were kept

Method of Insulating Aluminum Wire Electrolytically.

apart by blowing air through a tube sealed to the center of the connecting tubes. In this method there was again no column of electrolyte at the point of entrance, and it was at first necessary to form the coating in two steps of 200 and 400 volts respectively. This was superseded by the present method in which the wire also goes straight through and the increase in voltage is again established through a small weir and spout through which the wire enters. This latest apparatus has the additional advantage of allowing the removal and starting of the wire without threading through.—*The Electrician,* London.

ELECTROLYTIC PRODUCTION OF OXYGEN.

Several factories in St. Louis are now engaged in the electrolytic production of the commercial oxygen gas. According to the *"Engineer"* the electrolyte used is a 10 or 15 per cent. solution of either caustic soda or caustic potash. As direct current traverses the electrolyte the oxygen given off at one electrode is collected and compressed, while the hydrogen given off at the other electrode is allowed to escape. In one well-equipped oxygen factory in St. Louis it is claimed that the oxygen company can produce about three cubic feet of oxygen gas for each kilowatt-hour used.

GALVANIC CELL WHICH REVERSES ITS POLARITY.

When two plates—one of zinc and the other of tinned copper coated on one surface with selenium and varnished with enamel over the remainder of its surface—are immersed in tap water the electric current through a galvanometer connected to the plates shows that in the dark the zinc is electro-positive to the selenium, while the result of light falling on the selenium is to increase the effect, says A. A. Campbell-Swinton in *The Electrician,* London. If, however, instead of zinc, carbon or copper is employed for the non-coated plate, the interesting result is obtained that, while the selenium proves to be electro-positive to the carbon or copper in the dark, it immediately becomes electro-negative to carbon or to copper when it is illuminated, this being easily shown by the deflections of the galvanometer in contrary directions as the light is turned on and off.

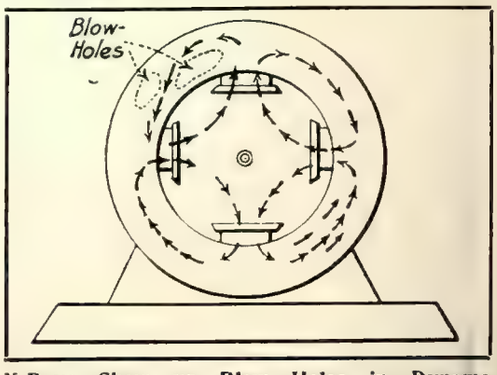
SLOW CATHODE RAYS.

In a recent lecture by Sir J. J. Thomson, at the Royal Institution, London, the electron discharge at different voltages, in a Coolidge type evacuated bulb were described. A curve was given which showed the relation between the voltage applied and the number of negative electrons radiated. The curve and also the experiments made, indicated that at least 15 volts was necessary to produce any appreciable radiation.—*The Electrician,* London.

A horse is very sensitive to electrical shocks and nearly always succumbs to 550 volt current. About 1,800 volts is required to kill a man ordinarily in the electric chair.

X-RAY TO LOCATE CAUSE OF BRUSH TROUBLES.

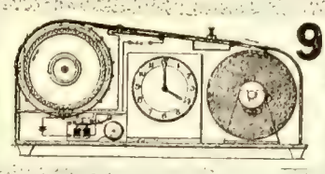
In electrical machines with cast iron or steel frames blow-holes may be present and may be large enough to increase greatly the reluctance of a section of the magnetic circuit. The reluctance being higher in one section of the circuit than in others will cause a lower voltage to be developed in a corresponding section of the armature, and local circulating currents will result. The blow-holes being concealed, it has often been found quite difficult to determine definitely whether or

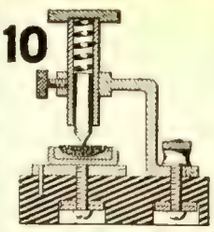


X-Rays Show up Blow Holes in Dynamo Castings.

not they are the real cause of the trouble. According to E. H. Martindale, of the National Carbon Company, says *Electrical World,* steps are now being taken to use X-ray machines to search for blow-holes in machine castings whenever it is suspected that high reluctance in the magnetic circuit is causing brush trouble.

LATEST PATENTS





A Brief Digest of the Latest Electrical Patents

LAMINATED IRON CORE (Fig. 1)—An arrangement of iron laminations in cores, making joints come in proper relation to magnetic flux path.

AUTOMATIC FIRE ALARM (Fig. 2)—A simple method to notify "Central" when a fire occurs at a subscriber's house. A fusible strip supports the receiver bracket, as shown.

TELEPHONE REPEATER (Fig. 3)—Improved form of telephone relay acting differentially. The magnet coil attracts armature, joined by levers to double action microphone.

ELECTRIC LOCOMOTIVE (Fig. 4)—This patent relates to the support of powerful electric motors above locomotive driving wheels, as shown, similar to the Pennsylvania Railroad type.

ELECTROLYTIC INTERRUPTER (Fig. 5)—Improvement in electrolytic interrupter consisting of one or more anodes, projecting upward as seen, in the bottom of the electrolyte container. Cathode enters at the top of container. This idea allows the gas bubbles to arise freely from the anodes.

SPARK-PLUG TROUBLE DETECTOR (Fig. 6)—A device to be used on motor cars, etc., connected in the sparking circuits, so that each spark may be observed as it passes through this series detector.

MAGNETIC VALVE (Fig. 7)—An electro-magnet is arranged to operate steam, gas or water valve, as shown, and also is provided with switch attachment, etc., for closing and opening circuit.

DRY CELL (Fig. 8)—Improvement in dry cell manufacture by which a rigid disc is placed tightly in the upper portion of cell against the mixture in order to retain same firmly.

ELECTRIC APPOINTMENT ANNOUNCER (Fig. 9)—A novel appointment announcer which operates by means of perforated paper strips, a clock, together with electric bell and battery.

RADIO DETECTOR (Fig. 10)—New "Pickard" detector, covering particularly the adjustment of contact point on mineral. Several movements are possible for the point.

ATTACHMENT FOR TELEPHONE TRANSMITTER (Fig. 11)—A hinged cover is provided for use on telephone transmitter mouthpieces, presumably to keep the dust out, etc.

MAGNETIC SEPARATOR (Fig. 12)—Useful form of magnetic separator for removing iron filings from brass, etc. Brass sleeve (4) can be slid down by handle (6) so as to throw off iron after it has been attracted.

STORAGE BATTERY (Fig. 13)—Comprises an outer shell with zinc amalgam on the inner surface, constituting a negative electrode; also inner shell having an outer surface of copper amalgam for the positive electrode. Inner surface of inner shell is zinc amalgam with lead plate within it, constituting the negative electrode.

MAGNETIC CLUTCH FOR SHAFTS (Fig. 14)—Strong magnet coil controllable from switch and battery, etc., causes two parts of clutch to be held together magnetically and vice versa.

ELECTRIC HORN (Fig. 15)—Diaphragm is vibrated by means of tooth on center of same, coming in contact mechanically with revolving toothed armature of electric motor, as seen.

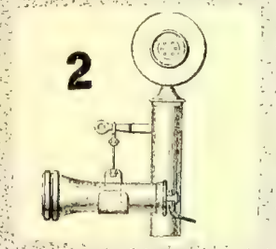
ELECTRO-PNEUMATIC HORN (Fig. 16)—A clever combination of electric and pneumatic horn, which is very compact. Can be actuated either by air bulb or electric button.

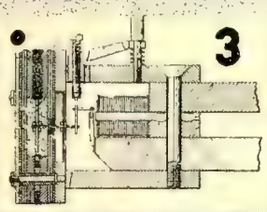
ELECTRIC WATER FOUNTAIN (Fig. 17)—Water fountain, having electric pump to circulate water through nozzle, etc., and also provided with electric lamp in center of water for illuminating effects.

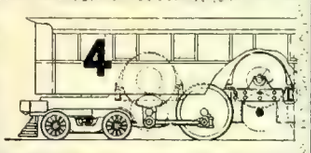
OSCILLATING FAN (Fig. 18)—Improved form of oscillating electric fan. Fan motor has gear attachment to cause same to be mechanically oscillated to and fro, in the usual manner.

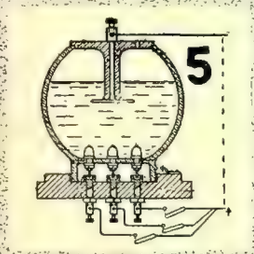
TELEGRAPH KEY (Fig. 19)—Vibrating form of speed telegraph key arranged to automatically close the circuit for certain length of time, as for dots and dashes.

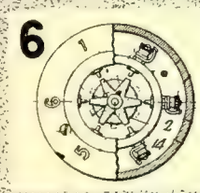
(Copies of any of the above patents will be supplied at 10c. each by the publishers.)

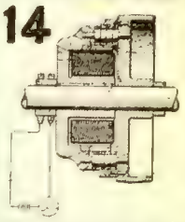


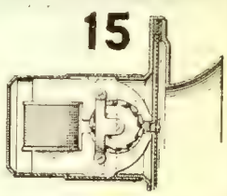


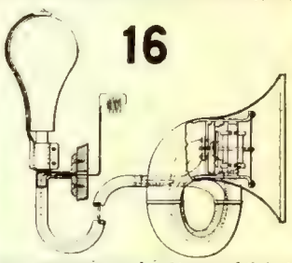


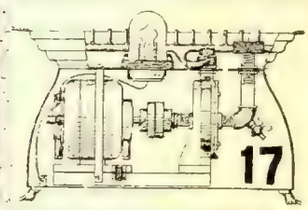


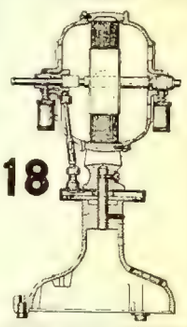


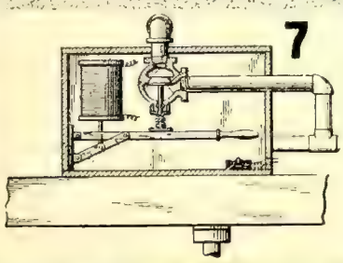


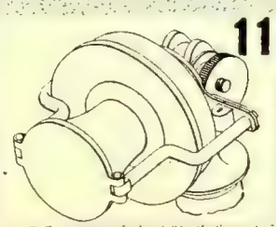


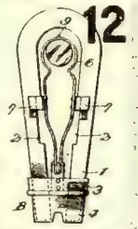


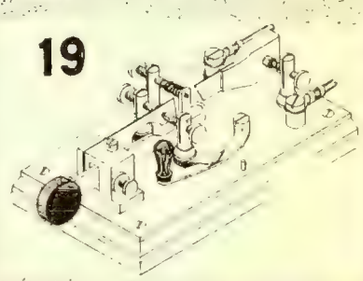












AMONG THE AMATEURS

AMATEUR RADIO STATION CONTEST.

Monthly Prize, $3.00.

This month's prize winner.

HENDRIX LABORATORY.

I am a regular reader of *The Electrical Experimenter,* and as I have made my wireless set what it is by reading this paper I would like to see a picture of my station in it. My aerial is 150 feet long, 105 feet above the ground at one end and 90 feet high at the other end. I have seven strands of solid copper wire No. 12 on 12-foot spreaders. The ground is a 12-foot galvanized iron pipe driven 11 feet into the ground.

My receiving set is composed of loading coil, loose coupler which tunes to about 2,500 meters, a rotary variable condenser in the primary circuit of the loose coupler, and a tubular variable condenser in the secondary circuit. I have two pairs of 'phones, one pair of 3,000 ohms and one pair of 2,000 ohms; potentiometer for electrolytic detector; also E. I. Co. Radioson, Ferron, Turney crystaloi, galena and perikon detectors. These are arranged on a six-point switch. I have a fixed blocking condenser with switches for adjustment, and a fixed condenser with switch across 'phones. A buzzer test is also included in the set, which incorporates a common buzzer, an amplifier and battery and push-button. A single slide tuning coil is also shown in the picture, which, by means of

Mr. Hiram Hendrix Receiving Arlington Time Signals Via Radio.

a switch, may be thrown in as an extra loading coil.

Here is a list of a few of the stations which I receive from: N. A. A., Arlington, comes in very strong; N. A. R., Key West, comes in quite strong; I. W. C. O., Springfield, Ill., quite strong. I also get Tuckerton, Sayville and Colon sometimes on exceptionally good nights. *I would like to exchange photos of wireless sets with other amateurs.*

HIRAM HENDRIX.

Wellsboro, Pa.

PHIL SCHMITT'S RADIO EQUIPMENT.

I am sending you a picture of my radio set. My transformer is ¼-K. V. A. I am using a quenched and rotary gap. The oscillation transformer is of Telefunken type. Almost all the instruments are my own make and style, made mostly from E. I. Co. goods. For an aerial I am using one wire about 500 feet long and 60 feet high. I am getting excellent results with it. The station is located in my bedroom, and the first and last thing when getting up or going to bed is to sit down and listen in or flash off a few "good mornings" or "good nights" to my radio chums. I have been a reader of *The Electrical Experimenter* ever since its first issue and it has been a great help for my experimental work.

PHIL SCHMITT.

New York City.

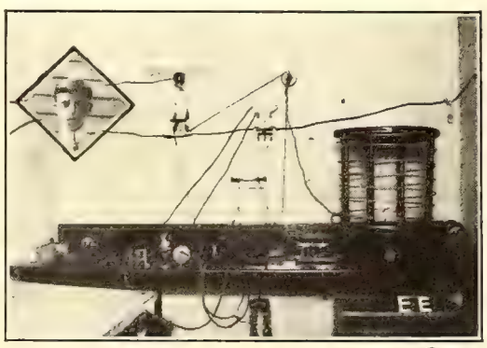
Phil Schmitt and His Excellent Wireless Equipment.

PARK SNYDERS RADIO STATION.

The transmitting set of my radio station consists of the following instruments: One-inch spark coil, wireless key, a large aluminum wire helix, two 1-quart Leyden jars and spark gap. The helix and the Leyden jars are home-made and the other instruments are factory-made.

My receiving set is composed of an Amco loose coupler, home-made loading coil, Brandes' 2,000 ohm head set, an E. I. Co. Universal mineral detector and a cat-whisker defector, a fixed condenser and a Murdock rotary variable condenser.

The aerial is 50 feet high at one end and 40 feet high at the other end, and is 85 feet long. It is supported at both ends by iron masts made of 1 and 2-inch pipes and is braced every 20 feet by three guy-wires. The aerial proper consists of four No. 14 aluminum wires, each 85 feet long and spaced 2 feet apart on 6-foot spreaders. These four wires are connected together at both ends. My lead-in is a No. 4 rubber insulated copper wire and is 20 feet long. This wire runs from the aerial to the



Park Snyder and His Wireless Transmitting and Receiving Set.

ground switch and from there a No. 14 copper wire runs to my instruments. I use two of the wires for sending and all four of them for receiving.

On the wall is seen my aerial switch and also a line switch. With this set I have no trouble in "talking" with other operators who live within a radius of 10 miles. I have had very good results in long distance receiving work and I hope to have better luck soon, as I am going to add another loose coupler and variable condenser to my set.

PARK SNYDER.

Connersville, Ind.

THE LEHIGH WIRELESS ASSOCIATION.

The Lehigh Wireless Association, with headquarters at Allentown, Pa., was organized Oct. 2, 1914. About a month ago the following officers were elected:

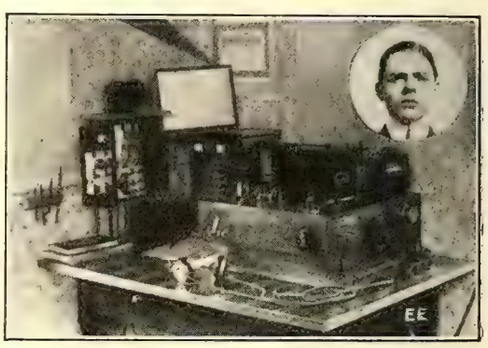
Earl Back, president; James Gardner, vice-president; Arthur Lentz, treasurer; Arthur C. Jacoby, secretary.

Almost all the members of the association have up-to-date transmitting and receiving sets and are also licensed operators. Meetings are held weekly at the home of the president.

The association has a 1-K.W. transmitting set, which can transmit about 100 miles, and messages have been received from NAR, NAU, NAW and WCC, and would like to communicate with other wireless associations. All communications are to be addressed to Arthur C. Jacoby, secretary, 517 Linden street, Allentown, Pa.

WIRELESS SET OF ARTHUR JACOBY.

Herewith is a flashlight photograph of my wireless station. Although I am not a



Arthur J. Jacoby and His Well Finished Radio Set.

subscriber I get the magazine every month in town. My aerial is 100 feet long, 70 feet high at one end and about 40 feet at the other end, composed of four strands of wire.

The station is equipped with a complete receiving and sending set. The receiving set consists of a loose coupler, two loading coils, three detectors, galena, perikon and crystaloi, one variable condenser, fixed condenser and a pair of 2,000-ohm 'phones.

The sending set consists of 1-inch spark coil, condenser, helix, spark gap and key, and can transmit about five miles. The station has a small switch-board with all the instruments wired to it.

The station has a receiving range of 1,000 to 1,500 miles day and night.

ARTHUR C. JACOBY.

Allentown, Pa.

ALBERT MEDAL TO MARCONI.

The Albert medal of the Royal Society of Arts, London, was recently presented to William Marconi. The medal was instituted in 1863, when the Prince Consort was president of the society. The medal is awarded annually for "distinguished merit in promoting arts, manufactures and commerce."

Phoney Patents

Under this heading we will publish hereafter electrical or mechanical ideas which our clever inventors, for reasons best known to themselves, have as yet not patented. We furthermore announce the grand opening of the

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PHONEY PATENT OFFIZZ

ANANIAS GASBLOWER OF CHAUTOKA

STRETCHMOTOR

No. 0009¼ **Potented June 63, 1915**

Specification of Phoney Patent
Application fired November 39th, 1769

TO ALL WHOM IT DOES NOT CONCERN:

Be it known that I, Ananias Gasblower, a resident of Chautoka, in the county of Ishkabibble, in the state of Wis., have invented a new and useful, revolutionizing means of conserving power, which since the beginning of the world has gone to waste.

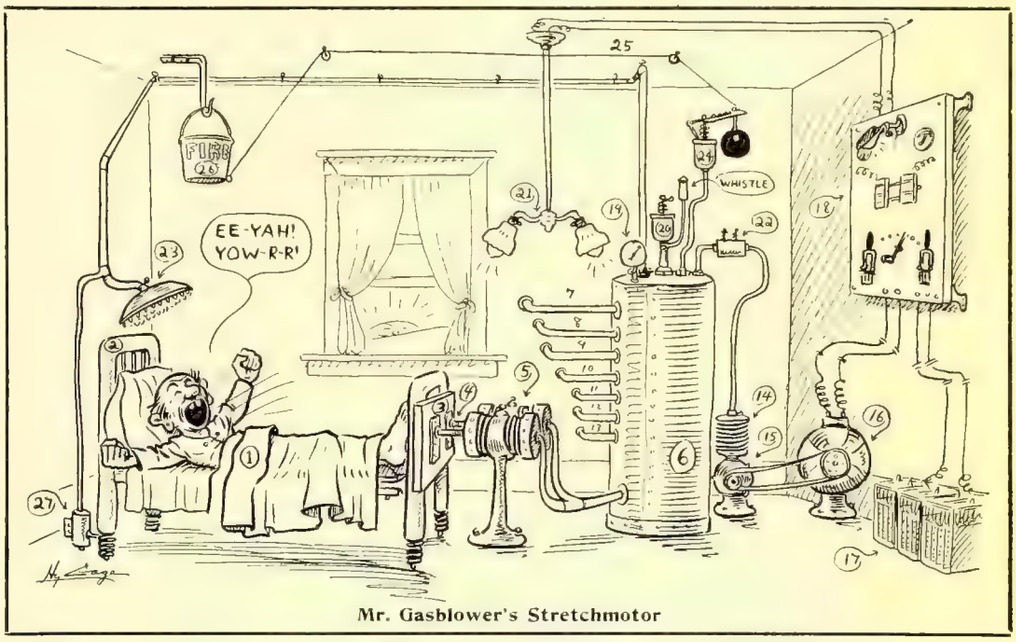
The object of this invention is to provide a means of collecting and storing the tremendous amount of power expended when man stretches himself after awakening in the morning. Up to now this power has gone to waste, but my new invention which I term the Stretchmotor, will do away with all this. It has been estimated that a full grown man giving a healthy stretch produces an average pressure at the foot of his bed of about 120 lbs. Most individuals stretch themselves from 4 to 7 times in the morning, each stretch lasting about 4 seconds. This means that a total energy is developed that could lift a weight of from 480 to 840 lbs. about 2 feet above the floor—a tremendous power. Lazy people or those fond of stretching will even do better. My calculations show that if the entire stretching power of every citizen of a town of 100,000 people could be converted and stored of only one morning, the entire city could be lighted up with electricity for 4 days, 6 hours, 12 minutes and 19 seconds.

With this object in view my invention consists essentially of an individual, a morning, a bed, an air compressor, a dynamo, a storage battery.

In the drawings which accompany and form part of this specification I have illustrated in diagram several features which embody the subject of my invention, and how the stretchmotor is operated in practice.

In the drawing (1) represents the individual, just awakening; (2) is the bed; (3) is the footboard; (4) are the connecting rods connecting the footboard with the piston of the air compressor (5); (6) is the compressed air tank in which the energy is stored; (7), (8), (9), (10), (11), (12) and (13) are pipes coming from the other bed-rooms of the house, each pipe being connected to a piston and a compressor, which in turn are attached to the other beds throughout the house. (14) Is the piston of the compressed air motor (15), which is belted to the dynamo (16), which in turn charges the storage battery (17); (18) is the switchboard and automatic cut-out; (19) is the air pressure gauge; (20) the safety valve. This safety valve has a whistle attached to it; thus if the members of the family generate too much energy the whistle will blow as a warning to all not to stretch themselves too long or too strongly. At (24) another valve is shown. This is a final emergency valve. It is technically called the Ultimatum valve. If the individual pays no heed to the sounding of the whistle and persists in stretching himself the pressure in the tank (6) may rise up to 12,000 lbs. per square inch. As soon as this happens the Ultimatum valve (24) opens, which in turn pulls down the string (25). This string runs over several pulleys to the water pail (26), which is upset thereby and its contents are poured over the individual (1), extinguishing him completely. (21) Are the electric lights, lighted from the storage battery (17). As soon as the pressure within the tank (6) reaches 6,000 lbs. per square inch, an automatic valve (22) opens and the compressed air flows in the piston (14), which operates the compressed air motor (15).

(23) Is a compressed air blast which starts automatically after the individual begins stretching. This air blast blows a strong blast of air in the individual's face, which is so disagreeable that he will get up and remain up. This discourages individuals from staying in bed once awake, and furthermore awakens them thoroughly. As soon as the occupant leaves the bed a spring (27) closes the airblast automatically.



Mr. Gasblower's Stretchmotor

In testimony whereof I have hereunto subscribed my name this 35th day of November, 1769.

ANANIAS GASBLOWER.

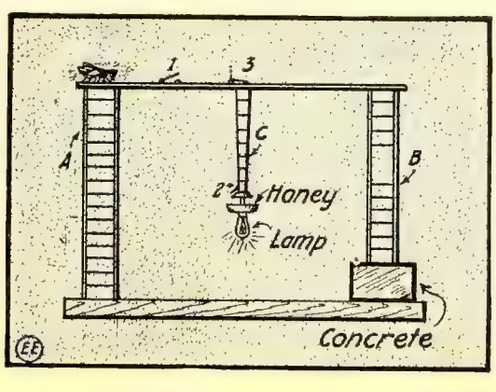
AN ELECTRIC FLY KILLER GUARANTEED TO WORK.

While there have been many electrical insect traps and annihilators perfected and patented, one of the most novel, perhaps, is described below by the aid of the sketch shown.

The inventor of this marvelous electrical "Fly Annihilator" has explained the principle of it as follows:

The fly is attracted to the device first by the odor of honey or molasses, which is placed in a small, inaccessible cup mounted over the incandescent lamp as indicated. The fly walks up the ladder "A" and along the footpath provided for his majesty at the top of the instrument.

The illustration shows the fly walking toward an electrical switch "1," and when he passes over same in his quest for the honey the electric lamp is thereby switched on. He then proceeds to climb rapidly down the ladder "C" toward the honey, guided, of course, now by the illumination from the lamp.



When he reaches the trigger switch "2" the lamp is extinguished, and at the same time a small spring-actuated barrier "3" stands up vertically, thereby effectually cutting off his retreat.

The little fly now starts to walk back up the ladder "C," and when he arrives at the top he has but one alternative, and that is to walk along the footpath and down the ladder "B" to terra firma.

Sad to relate, there are about three steps missing in the ladder "B," and before he has time to "watch his step" he is precipitated violently onto the concrete block below and dashes his brains out.

QUESTION BOX

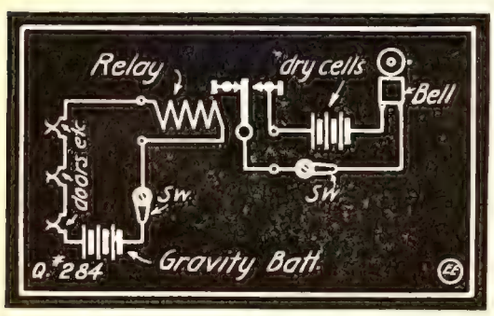
This department is for the sole benefit of the electrical experimenter. Questions will be answered here for the benefit of all, but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail.

CLOSED CIRCUIT BURGLAR ALARMS.

(284.) Leopold M.——, Brooklyn, N. Y., asks several electric burglar alarm questions:

A. 1. You will undoubtedly have to employ a closed circuit battery, such as the gravity cell, for your particular form of burglar alarm. Diagram is given showing how this is used with a relay, and if the wire in the main circuit is cut by an intruder at a window, for instance, then the



Closed Circuit Burglar Alarm.

battery current, of course, will be cut off from the relay and the armature of same will be released by its magnets; this allows the armature to drop back against the contact screw, as will be perceived, thus closing the alarm bell circuit.

The relay in this case should have a fairly high resistance of, say, 150 ohms' value; three to four gravity or crow-foot cells will be all right for the work. Ordinary dry cells can, of course, be used in the local (open) alarm bell circuit to the number of three or four for a medium-size bell, etc.

STATUS OF PATENTED ARTICLES.

(285.) William Foerste, Pelham Manor, N. Y., inquires as to the status of patents on wireless devices as related to manufacturing, etc.:

A. 1. You can manufacture or sell wireless and electrical apparatus as you mention without obtaining any license, except instruments which are patented and already sold under a license, etc. In this case you will, of course, have to take up the matter with the owners of the patent or the company who already builds the instrument. Otherwise you are liable to get yourself into no end of trouble. We may say in this direction that from many cases which have been settled in the past of such a character it has been the rule that invariably the party making apparatus without license rights from the patent owners have had to pay all the patent royalty accruing on the total sales of such instruments for the total period during which they were manufactured prior to court action.

A. 2. We are not familiar with the details of the wireless system utilized by Mr. Eugene Dynner, of Guttenberg, N. J., but you can, of course, write to him and he will be undoubtedly glad to give information you desire.

TRANS-ATLANTIC RADIO PLANTS.

(286.) Donald Rockwell, Wellsboro, Pa., wants to know why the powerful radio station at Arlington, Va., was not shown on the map of Transatlantic radio stations published in the March *Electrical Experimenter*:

A. 1. The reason why the radio station at Arlington, Va., was not shown in the recent Transatlantic Radio Map was due to the fact that Arlington is not considered, in the ordinary sense, a Transatlantic wireless station. While the signals from Arlington have been heard across the ocean it does not do this work regularly, as is the case with the German stations at Tuckerton, N. J., and Sayville, L. I.

We have no data on the operating range of the radio station at Colon, Panama, but it has been heard in New York City a great number of times by experimental wireless stations.

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STORAGE BATTERY TROUBLE.

(287.) Fred Taylor, Norfolk, Conn., says his storage battery will not hold a charge for any length of time and wants advice on his probable trouble:

A. 1. We do not know what your battery trouble may be, but possibly the cells need washing out thoroughly, as there may be some collection of sediment on the bottom of the jars. In this case the electrolyte should be poured out of the jars and they can then be filled with clean water and flushed out several times, till the water flows clean. The electrolyte should then be strained through a piece of fine cloth and replaced in the battery. Add distilled water to bring its specific gravity to proper point if high in density. Also add distilled water only in filling up cells to cover plates when exposed by evaporation of water in electrolyte.

In some cases the battery plates become covered with a white coating known as sulphate. If you are having trouble of this character the following directions for sulphation treatment will probably be of service.

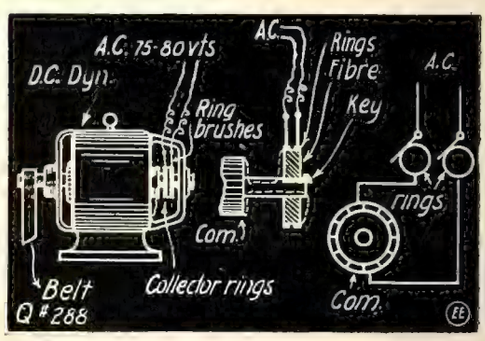
For sulphation treatment charge the battery as rapidly as it is possible to send current into it without overheating. The resistance being greatly increased by the effect of the sulphate, the cell will become hot when charging. Use a thermometer in the electrolyte to test the temperature and maintain the current at such a value that the temperature of the cell does not exceed 110 degrees F. Continue this charge until the plates begin to gas freely, then reduce the rate of charge to the eight-hour rate and continue this until the plates again begin giving off gas. The rate of charge should then be reduced to half the eight-hour rate and continued until further gassing again occurs. The cell should then be partly discharged and the treatment repeated. This cycle of operation may have to be carried on for some time, but should be continued until the negative plates show at least 0.10 volts between a cadmium electrode and the negative plate, the cadmium being positive to the negative.

ALTERNATING CURRENT FROM D. C. DYNAMO.

(288) G. L. La P., Iowa, wishes to use some form of mechanical interrupter on his 110-volt D. C. dynamo circuit (3 K.W.) instead of an electrolytic interrupter, for operating his wireless set.

A. 1. We do not know anything to suggest in the matter of operating a couple of ½ K.W. transformer coils on 110-volt D. C. circuit with some form of mechanical interrupter. We would further advise that it is not generally satisfactory to use a mechanical interrupter for 110-volt circuits in the way you propose.

A suggestion for you in this direction,



A. C. From D. C. Dynamo.

and we believe you would find it the best of all, is cited below; besides, this would enable you to use a rotary spark gap of the synchronous type.

The sketch depicts this suggestion in detail, and it simply consists of placing two brass collectors on your dynamo shaft, with two brushes placed in contact with the rings, from which to take alternating current. These two rings are connected to

diametrically opposite commutator segments, as the diagram shows, and you can in this way obtain about 75 to 80 volts alternating current, if your direct-current dynamo rating is 110 volts.

The dynamo is driven in the regular way by belt, and also you can arrange your rotary spark-gap disc or arm on the end of the shaft by extending same, if necessary, and you will then have a synchronous spark-gap outfit similar to the Fessenden style commercial sets.

With this arrangement you may use a closed-core wireless-type transformer, etc., or you might make up an open-core transformer from three ½-K.W. transformer coils.

Instead of the rotary gap you can also very readily employ a quenched spark gap. We presume your D. C. dynamo is a two-pole machine, and you will then get in the neighborhood of 60 cycles frequency A. C. with the armature running at 3,600 R. P. M.

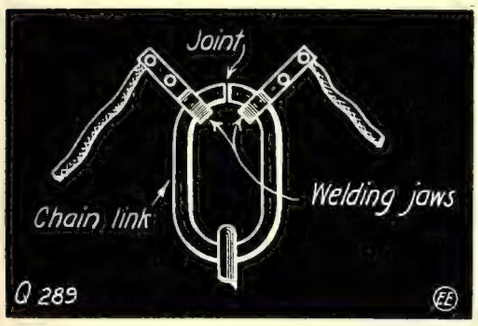
The commutator is left the same as it now is, and if you desire to take A. C. only from the machine, and if there is not sufficient room to place the collector rings and their fiber drum between the commutator and the bearings, you might arrange to mount this drum and rings on top of the commutator. A local machinist can do this for you at small expense.

Another scheme in this direction is to mount the collector-ring drum on the outer end of the shaft beyond the bearing, and to bring the two wires to the collector rings from the commutator through a small hole bored through the center of the armature shaft, as the sketch shows.

ELECTRIC "CHAIN" WELDING.

(289) John Burkett, Madoc, Ont., Can., asks several questions.

A. 1. There have been no recent developments in the use of iron cores for high-frequency tuning coils, etc., and the reason why they are not used for this purpose is due to the fact that the iron tends to lag behind the magnetizing current in its magnetic reversals of polarity, etc. This creates a very bad power-factor and occasions, therefore, considerable losses in the coil.



How Chain Links Are Welded Electrically.

A. 2. Answering your second question regarding the welding of wire fencing and chain links, etc., by electricity, would say that this takes place on the basis that the electric current will always, of course, take the shortest or lowest-resistance path through a conductor, and you can thus see that by proper arrangement of the welding-machine jaws and contacts the shortest path for the current will, for instance, in the case of a chain link be through the joint in the link, as the sketch herewith shows.

Special arrangements of the contact jaws of the welding machine are made use of in electric fence welding.

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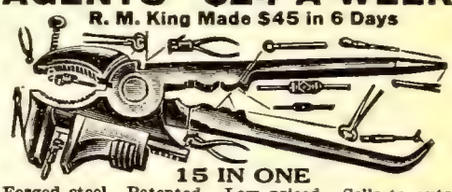

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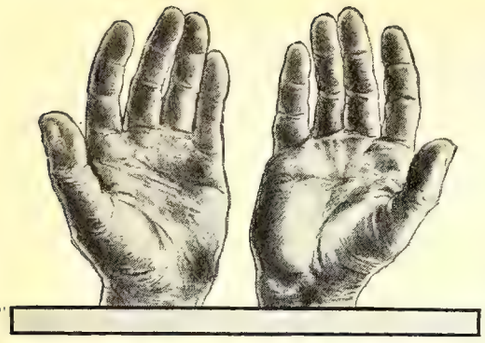

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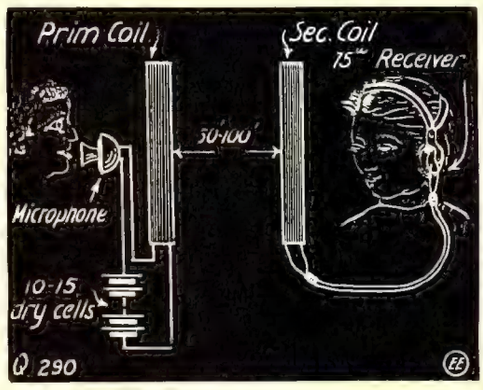
The theory of this work is that the electric current will always, as aforesaid, take the path of least resistance through a conductor, and as the greatest amount of current will thus pass through the shortest part of the chain link, for example, it is patent that this part of the circuit will become the hottest and will thus be welded electrically, as the heating effect in a circuit is due to the value of the current in amperes, squared, multiplied by the resistance in the circuit in ohms.

INDUCTIVE SYSTEM RADIOPHONE.

(290) Edward L. Jewett, Sullivan, N. H., inquires about building an inductive-type wireless telephone using two large coils of wires acting on each other by electro-magnetic induction.

A. 1. Regarding the inductive type of wireless telephone, would say that of course the large the coils are made, other things being equal, the better this arrangement will talk. It is, however, only adapted, generally speaking, to short-range demonstration work and the like.

The wire you mention for the coils is all right and it is well to make the receiving coil of finer wire, as suggested, as the receivers of course have a higher resistance and cannot be benefited by the heavy



Inductive Type Wireless Telephone.

current generated in a coil of large-size wire.

You are correct in assuming that it is the ampere-turns in the coils which count most; but of course the various parts of the circuits should be properly related to each other in any case. This matter is fully discussed in H. Gernsback's 25-cent book, "The Wireless Telephone," supplied by our book department.

RADIO QUESTIONS.

(291) L. B. Wilcox, Angola, Ind., asks us several wireless questions on spark gaps, etc.

A. 1. The rotary spark gap you mention should be all right. To properly break the detector circuit with break-in system, as you mention, the detector should be short-circuited by means of automatic switch or by extra contacts on the transmitting key, whenever the transmitting set is excited.

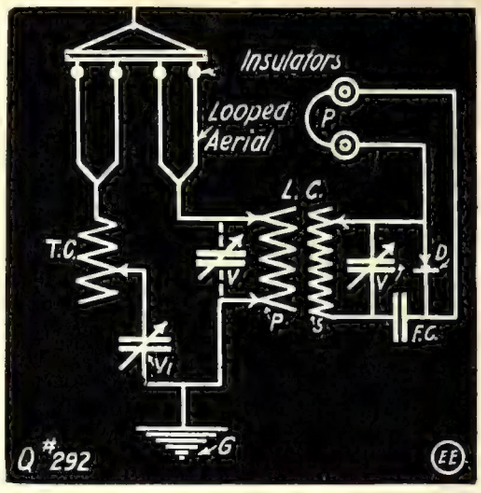
We do not recommend an iron-filings refer you to the February, 1915, *Electrical Experimenter*, wherein you will find curves given for reading wave lengths direct.

We do not recommend an iron-fillings core for your transformer, but a sheet-iron or an iron-wire one will prove superior, we believe.

The wireless station at Key West, Fla., sends time signals and weather reports via radio at noon, Eastern time.

VARIABLE CONDENSER CONNECTION.

(292) Austin Hewes, Crete, Ill., wants to know how to hook up a variable condenser to his radio receiving set, and he



Looped Aerial Connections.

also complains of severe static signals in his 'phones.

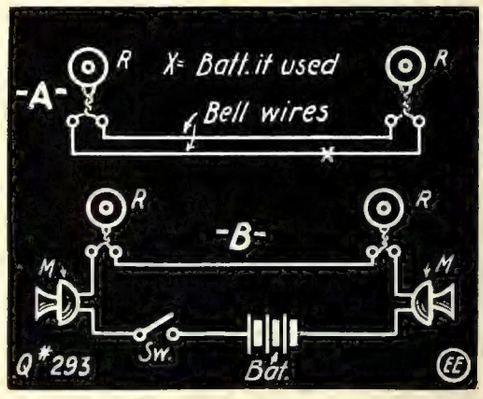
A. 1. The variable condenser may be connected across the secondary of the loose coupler. The diagram here shown has been used by several of the commercial radio companies and you will find this arrangement will enable you to tune out a great deal of static, etc., through the static tuning loop, comprising a tuning coil T.C. and variable condenser V_1, as observed.

SERIES TELEPHONE.

(293) H. J. Brown, Cleveland, O., writes us regarding the use of two 75-ohm telephone receivers on a bell circuit for telephone purposes.

A. 1. We give you herewith diagram (at "A") showing you how to use a couple of telephone receivers of the 75-ohm type for carrying on conversation over a bell wire circuit, etc.

It sometimes improves matters a great deal to connect a couple of dry batteries in the circuit, and you will vastly improve the efficiency of this arrangement if you connect in a couple of regular microphones



Series Telephone Hook-Up.

"M." You will then have what regularly constitutes a series telephone circuit, capable of talking over a number of miles. The battery should be cut out when through talking by a switch.

Note: On July 1 the subscription price of THE ELECTRICAL EXPERIMENTER goes to $1.00. Don't fail to take advantage of the present low rate! See page 95.

PATENT ADVICE

Edited by H. GERNSBACK

Shall He Patent Detector?

(1) Alfred Smith, Waukegon, Wis., submits a drawing and plans of a wireless detector stand; he wishes to know if we advise him to apply for a patent on the instrument.

(A.) As a general rule would-be inventors of detector stands could save a lot of money and energy by not trying to patent such devices. While we do not say that a patent could not be obtained on the detector stand described by our correspondent, we certainly will say that such a patent would assuredly not be of much commercial value.

It should always be borne in mind that it is a rather simple matter to obtain a patent, but it is another thing to exploit the same patent commercially. After all, a patent is not obtained except to exploit it commercially; it is no honor to have a long list of patents that lay idle and on which much money has been expended, if such patents are not utilized commercially. In the case of the detector stand of our correspondent the article no doubt has some original points, but none of them is novel enough or strong enough that it could not be evaded by a clever constructor. There have been so many detector stands described in the current literature that it is almost impossible to find any kind of a detector movement that is novel and that could not be easily modified by anyone.

We strongly advise would-be inventors not to spend money in trying to patent detector stands or similar appliances.

"Patent Applied For."

(2) Henry Schneider, Milwaukee, Wis., asks us if he can market an article on which he has applied for patent some time ago, but on which the patent has not as yet been granted.

(A.) We strongly advise against marketing any article which has not been patented. The mere reason for applying patent does not mean anything whatsoever and affords no protection for the following reasons:

If your article, on which you have patent applied for is put on the market, and if a competitor should market a similar article it will be impossible for you to bring any action against him because you have no patent. Also, if your competitor wishes to do so he can file a patent application covering the identical article. This means that there would be in the Patent Office immediately what is technically called an *"Interference."* The Patent Office will then throw the two applications out and will let the two contestants fight the case out between themselves. This usually is quite an expensive procedure and unless the invention is quite valuable it is not feasible for the two contestants to fight it out in court. Most of the time the patent case is dropped all together, while the original inventor must either go on fighting his opponent or else allow him to manufacture the same article. Another feature is that it is impossible to foretell how soon a patent will issue even if no "Interference" is recorded at the Patent Office; your patent may not *issue* for years.

In the meanwhile a competitor could establish a growing business and while you might collect back royalties from him afterwards, if your patent is finally proven valid, it invariably means expensive law suits. Besides, if your competitor has once obtained a start it is usually very hard to stop him.

For these reasons we would advise all inventors to be very cautious and not to market an article until the patent has been granted by the Government.

Once you can show that the patent has been allowed and your label or literature is sent out with your merchandise calling attention to the patent, most people, unless they feel sure of their grounds, will not attempt to manufacture the same article. This is where a patent usually protects.

Is Switch Patentable?

(3) Alfred B. Duck, Richmond, Va., has sent in a rough sketch of a switch and wishes to know if we advise him to patent the invention.

(A.) The sketch is so rough and incomplete that it is impossible to tell just how this is supposed to work; also, the description is not clear enough for us to form an opinion of the function of the supposed invention. We would ask our correspondent to send in a better sketch and a better description.

We publish this merely as a request to inventors to make their sketches as clear as possible when sending drawings to this department. This will do away with a great deal of delay and will make it possible for this department to publish the answer at once. It should be borne in mind that this department does not answer patent questions by mail, but publishes all information of this kind for the benefit of all readers.

Search for Patentability.

(4) Fred P. Opp, Cleveland, O., asks us how much it costs to have an attorney make a search in the Patent Office in order to find out whether an invention is patentable.

(A.) There is no fixed charge for work of this kind to our knowledge. Some attorneys do not make any charge whatsoever if they have an order to patent an invention. Others charge small sums from a few dollars upwards, all depending upon how much work has to be expended.

At the Patent Office most inventions are filed in classes, thus, for instance, there is a class for wireless detectors, another class for non-refillable bottles, another class for electric lamps, etc. It is easy to understand that if a patent attorney must consult several thousand previous patents the charge will be very much higher than in the case of a new art; as, for instance, a wireless detector, of which not over 200 have been patented. For that reason it will be seen that it is impossible for anyone to say how much the fee will be, and the best thing in this case is always to consult a patent attorney and find out. Such information is gladly given by all attorneys.

Patenting a Hook-up.

(5) William B. Nelke, San Francisco, Cal., has sent in a blue print showing the hook-up or diagram for a wireless telephone and wishes to know if we think that he can obtain a patent on this invention.

(A.) Nothing new is seen in the hook-up which our correspondent has submitted

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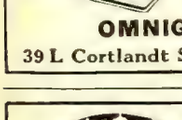

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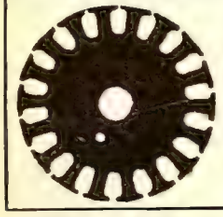

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to us. While the arrangement of the choke coils and the connection of the microphone differs somewhat from existing connections, we do not think it would be a wise thing to attempt patenting this hook-up, as we are quite positive that no patent could possibly be obtained.

We advise against attempting to patent any kind of a hook-up because it is one of the very hardest things to obtain a good patent on mere connections or circuits. Unless some novel instrument or other features are made a part of the patent a circuit alone will not be of much value, as most anyone could use such a circuit anyway, privately or otherwise, and it would be almost impossible for the patentee to know whether anyone was infringing on his patent or not. There are, of course, a good many circuits or, as they are usually termed, systems patented, but we doubt if there are many of much commercial value.

BARON MÜNCHHAUSEN'S NEW SCIENTIFIC ADVENTURES.

(*Continued from page 90.*)

"tasted" exactly like sulphuric acid fumes, similar to the fumes given off by a storage battery when it is "gassing." After a few minutes we became accustomed to the sharp atmosphere, but we found it very hard to breathe at first. Then our bewildered senses became conscious of the fact that we felt a warm glow all over our bodies and in a few minutes we became exhilarated as if intoxicated. For three-quarters of an hour we were actually drunk, and it was exceedingly hard to think clearly during that time. This effect, however, wore off too, and at the end of the second hour we could breathe fairly easy, although our lungs pained terribly and we spat blood at frequent intervals.

An analysis of the moon's atmosphere made by us shortly thereafter explained our odd behavior and the strange effects of the new air upon us. To begin with, the moon's air is very thin, only about 1-16th the density of the earth's atmosphere. Where the earth's atmosphere is composed of about 79 per cent. nitrogen and 21 per cent. oxygen, the moon's atmosphere contains 26 per cent. carbon dioxide, 24 per cent. nitrogen and 50 per cent. oxygen. The carbon dioxide caused us to cough so violently while the invigorating oxygen in its prepondering proportion in the air intoxicated us. If the moon's air were as dense as that on the earth I doubt if a human being raised and brought up on earth could survive. But by being 1-16th as dense as the terrestrial atmosphere, together with the fact that oxygen is very beneficial to the respiration, it becomes possible to endure the moon's thin air comfortably. It is interesting to note that if vitally necessary human nature will adapt itself successfully to even the most difficult surroundings. This we found out speedily; within 48 hours we not only breathed with comfort and wholly without pain, but we found the new air so enjoyable as well as invigorating that we looked forward with dread of again inhaling the stuffy terrestrial atmosphere. After one grows accustomed to the singular smell of the moon's air one comes to cherish it. It acts like a powerful tonic, the oxygen no doubt being largely responsible for this.

At first, of course, we found it very difficult to walk on the moon's surface, for the reason that we weighed so little now. The earth being 50 times as large in bulk and 1.66 times denser than the moon, it naturally attracts all bodies with much greater force than does the moon.

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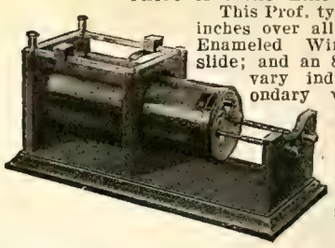

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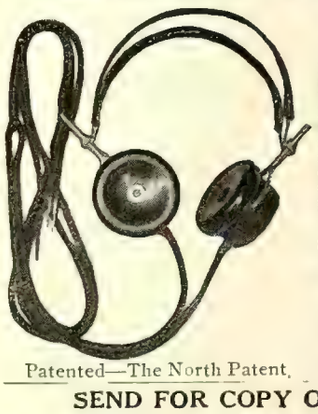

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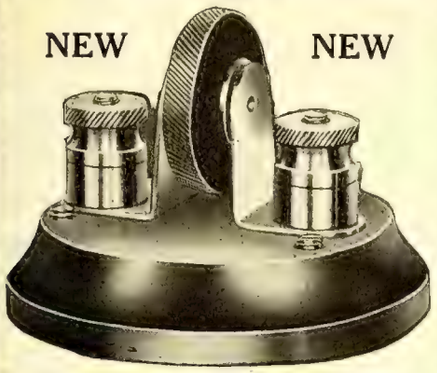

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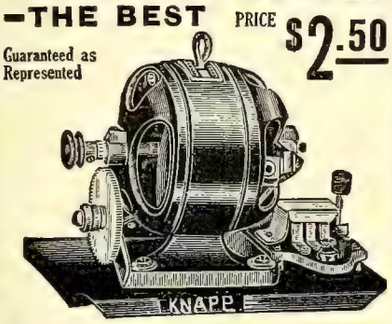

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Thus a stone weighing one pound on earth weighs but 0.167 lb. on the moon, which is just one-sixth of the weight the stone has on earth. My own weight on earth being 170 lbs. it naturally follows that I could weigh but 28 lbs. on the moon. Buster, who weighs some 10 lbs. on earth, weighs but 1½ lbs. on the moon. He found this out soon when he began to jump about. On earth he would not have jumped higher than about 4 feet. On the moon his 1½ lbs. carried him six times higher, for he expended as much muscular energy in his jump as he was accustomed to do on earth. Consequently he went up some 24 feet into the air. This frightened him considerably, for he had never jumped so high in all his life. As in the *"Interstellar,"* he became more careful thereafter and limited his jumps to 10 or 15 feet in height.

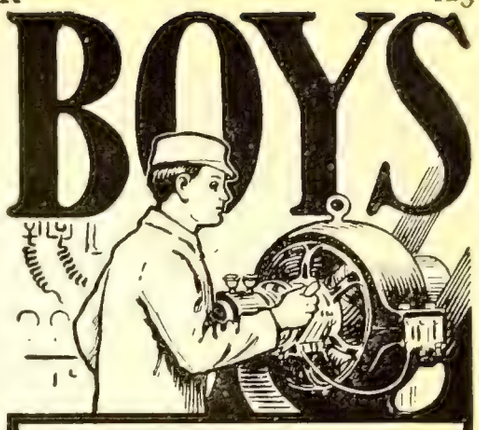
Flitternix, as well as myself, amused ourselves in a jumping contest for some time and it was astonishing to us how high we could jump. Twenty-five to 30 feet was easy of accomplishment, and we did not come down hard either, for we weighed so little. One thing, however, we found out speedily. The moon's atmosphere even at the little elevation of 30 feet becomes so thin that it is impossible to breathe. For that reason we discontinued our high jumps soon and preferred long horizontal jumps after that. Subsequently we established the following facts:

The only atmosphere in which any kind of living creatures could exist extended but 20 feet above the surface of the moon. Sixty feet above the moon there was no trace of atmosphere. Here the vacuum of space begins. On earth, it will be noted, no atmosphere exists beyond 35 miles above sea level. Thus we found it impossible to scale the lunar mountains or even a low hill.

There being so little atmosphere on the moon, no clouds whatsoever, and but very little wind, it follows that the temperature of the moon's surface must be rather comfortable. We measured 78° Fahrenheit in the shade of the *"Interstellar."* Nor did this summer heat subdue during the long day of nearly two weeks. (The length of the day on the moon is almost two weeks, the length of the night being of the same duration.) This intense sunlight also made it impossible to walk about without some form of protection, but as we had brought our tropical sunshades along we were but little troubled on our long tramps, despite the heat. Without this precaution our hands and face blistered rapidly, due no doubt to the effect of the sun's ultra-violet rays through such a thin atmosphere, which offered but little protection.

After several hours immediately following our landing we concluded to leave the desert in order to investigate the nearest chain of mountains some 60 miles distant. Re-entering the *"Interstellar"* we started our tractor machinery and the big globe began to roll on its wide landing belt over the hot sands of the moon at a comfortable speed. In a few hours we came to a dead stop in the shade of an enormous mountain rising some 16,000 feet above the surface of the moon. No vegetation or any sort of life could be perceived anywhere, but curious marks on the ground convinced us that there must be indeed some form of life on the earth's satellite.

Arming ourselves with our large caliber guns we set out to follow the tracks. Buster, who ran ahead of us with his nose to the ground, had become excited and within a ten minutes' walk we entered an immense canyon with almost perpendicular walls several thousand feet high. This canyon was nearly closed at the top and



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it was probable that the sun never reached the bottom. There was but little light and we had to advance cautiously, guided by Buster.

The temperature was rather comfortable, about 50° Fahrenheit, as our subsequent investigation proved.

As we walked on, the canyon seemed to become lighter, but we soon observed that it was not sunlight. The color of the light was of a pale green. We were very much puzzled at this and not a little excited, so we pressed on forward. We finally rounded a projecting corner and beheld a sight such as no humans had ever seen before.

The canyon, which by this time had become entirely closed at the top, suddenly widened out into a colossal cave of immense proportions. We found out later that the cave was roughly 12 miles in length and 8 miles in breadth. Although entirely closed at the top it was almost as light as day inside, the light, however, being of a vivid green. Almost the entire bottom of the cave was taken up with a lake and the light came from the lake itself. Within a few minutes we had reached the edge of the water and we saw immediately why the lake gave forth such a strong light.

We stood fascinated for some time at the sight which presented itself to our eyes. The lake was crowded as far as the eye could reach with a sort of eel fish —*and each fish was luminous.*

You have, of course, seen the common firefly during a hot summer evening. Take your firefly, extend it about four feet to the size of an eel, put it under a clear limpid water, and you have a good description of our lunar luminous fishes.

The sight of these strongly illuminated eels darting back and forward under the water with lightning speed is magnificent; it offers a wonderful spectacle. You can follow each fish to a considerable depth, for the light which they emit is very powerful. We found out that each fish produces some 60 candlepower of light. Here at last we are face to face with an exceedingly practical application of "cold" light, which our terrestrial scientists have been searching for for decades. We also observed that the fishes are luminous only while in motion. As soon as they stop swimming the light vanishes instantly. We have since observed that the light is produced by the friction of the fish's body against the water. Flitternix is not sure as yet whether the action is electric or chemical.

We marveled how nature always finds out a way to favor life, even under the most difficult surroundings. As life was manifestly not possible on the moon's surface on account of the blistering heat (and the extreme cold following) nature promptly produced it *under* the surface. As the higher forms of life require light for their existence and as there was no light under the moon's surface, nature saw to it that its life carriers were equipped with light themselves!

We were naturally overjoyed at our discovery. We knew now that there was at least water on the moon, despite all our scientists' theories. Buster was the first to try it and after a few cautious licks he decided that it was really water. We followed suit and immediately noticed that the water was slightly tart in taste, which, however, made it an excellent thirst quencher.

We discovered later that all of the moon's subterranean waters tasted alike, the tartness undoubtedly being produced by the ever-occurring sulphur which seems to abound on the moon.

We found it was comparatively easy to catch one of the luminous fishes, which was almost 4 feet long, and after killing it we decided to take it along to test its edibility. During the next few hours we also killed several luminous turtles of enormous size. As we did not see any other living creatures on the shores of the lake we decided that it must have been one of these turtles whose footprints we had seen outside of the canyon.

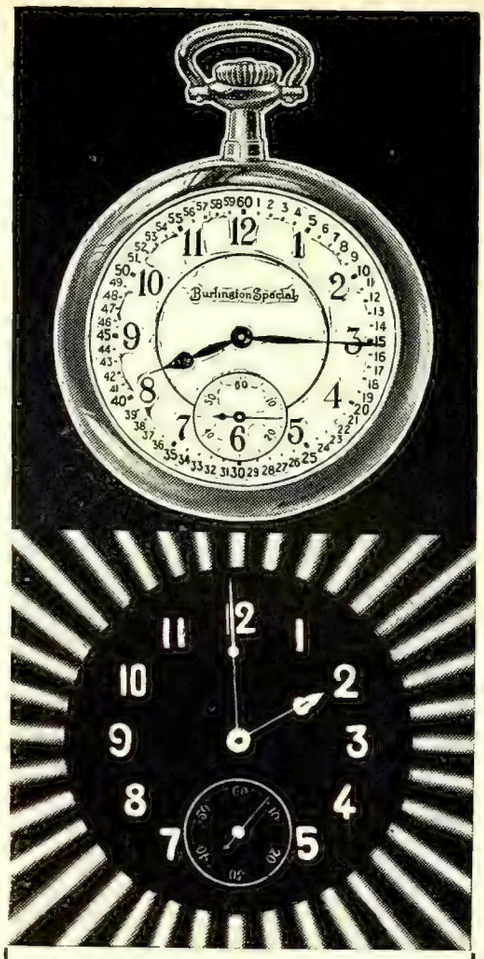
A survey of the cave showed that its southern wall was composed almost entirely of some form of coal similar to our terrestrial anthracite. We knew now that we were in no danger of starving. We had the water from the lake, meat from the fishes, as well as the turtle, and fire from the coal. We naturally felt highly elated, so Flitternix as well as myself decided to extend our visit to the moon as long as practical in order to fully investigate this newest world.

During the next few days (by this I mean a day of 24 hours' duration) we explored the entire cave and we came across many queer animals, mostly of the turtle type. We found few hairy or feathered types and nothing that approached even distantly the human form, as, for instance, the monkey type of our earth. We found that there was quite a little vegetation inside of the cave, mostly of the fungus type; there were also low shrubs and some dwarf forms of a peculiar bread tree. This bread tree is very similar in many respects to the terrestrial bread tree (*Artocarpus incisa*) as grown in some of the Pacific Ocean islands. We found its fruit, after baking it, highly nutritious as well as exceedingly tasty. The turtle meat was excellent and the fishes tasted somewhat like eels, with a fresh-water trout flavor. We found many varieties of mushrooms, some of enormous size and mostly edible. There was, furthermore, an abundance of various curious nut bushes and, with a few exceptions, all were very tasty.

You see we do not starve on the moon, even if it does look dead through a telescope. On the contrary, we are well provided for and could extend our stay indefinitely if we were so inclined. As a matter of fact we are in no hurry just now to return to mother earth, we like it so exceedingly well here.

We discovered soon that there were thousands of caves such as the one which we first discovered scattered all over the moon. These caves are all much the same, all illuminated, by means of their luminous animals. The caves vary, of course, much in size as well as in shape; some of them are hundreds and some even tens of thousands of feet below the surface of the moon. This is quite natural. The moon is a cold world unlike the earth, which is still in a molten state in its interior. The further you descend in the moon's bowels the colder it gets, but the atmosphere becomes denser also. Equipped with electric lanterns, we visited a cave several hundred feet below the moon's surface. The cold was intense, and we saw no living being of any sort, nor any plant life. What had been water once, myriads of years ago, was ice now, frozen down to the bottom. The sight was so desolate and so depressing that we hurried back to the surface as soon as our investigation was completed. We decided not to visit any more caves except those located near the surface of the moon, where the solar heat still could make itself felt.

During the next few days we found immense deposits of various metals, such as platinum, gold, copper as well as iron ore. There seems to be an abundance of these metals on the moon. We also found a curious metal (or it may be an alloy) which melts at a temperature as low as that of tin, but is as hard and flexible as steel.



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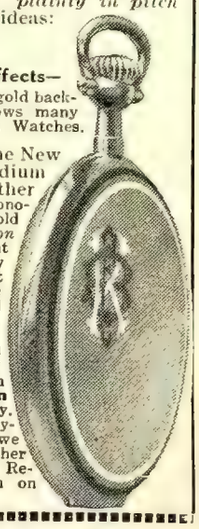

On Approval: The New radium dial Burlington or any other Burlington, with your own monogram engraved on the suberb gold strata case, will be sent to you *on approval*, prepaid, without a cent in advance. You risk absolutely nothing—you pay nothing—not one cent, unless you want *this exceptional* offer after seeing and thoroughly inspecting the watch.

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Name.....

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We named it *Busterium* in honor of Buster, my fox terrier, who was the first terrestrial being to land on the moon.

But now, my dear Alier, I must terminate our chat for this evening. This is moving day for us. The sun is chasing us rapidly and Flitternix says we have only three hours before the *shadow* overtakes us."

"I do not quite follow you, my dear Münchausen; won't you be a little more explicit, please?"

"Certainly, my boy. You know that the moon revolves on her axis once in about 27 days. Her term of daylight must therefore be the half of 27 days, or nearly two weeks, and her night must consequently be of the same length.

"At the present we are somewhat in the neighborhood of the moon's equator. Within a few hours the spot on which I sit will be in the dark—it will be night—the beginning of the lunar two weeks' night. Already the sun is low in the heavens. As the temperature will fall below zero as soon as night sets in, and as we do not cherish to be frozen we have no other choice but to move our present position. We will, therefore, break up our camp shortly and will board the *"Interstellar"* once more. A few hours' ride will bring us to the other side of the moon, where it is now morning. Once we reach that spot we can make camp again for two weeks, the duration of the lunar day.

"Well, I must hurry, my dear boy; anyhow, it is one o'clock for you now and I have an idea that your bed is calling you. Therefore, *au revoir* till next time."

Keee-ee-ee-ee, Zeee-ee-ee-ee-ee. Zeee-eee-ee-eee é é é é é eeh-blob-blobb-flum-, and he was gone. The ether was quiet once more.

ELECTRICITY, THE POWER BEHIND THE SUBMARINE BOAT.

(*Continued from page* 105.)

base on board a German warship or a land station.

The general lay-out of the electrical equipment on board the submarines, and particularly the storage battery unit, is such that when cruising, or when lying to, the oil engine can be used to drive the dynamo by suitable throw-over mechanical gear and the dynamo then charges the storage battery so the vessel will be ready for the next dive under water.

The storage battery supplies electric current for a large number of different apparatus on board, including several electric motors for driving water tank and submersion pumps; also the current for operating electric heaters placed about the walls of the submarine, electric lights, the radio transmitting set, compressed air pump, small ¼-h.p. motor for turning the sighting periscope, through which the commanding officer obtains his view of warships, etc., on the surface of the sea, as the illustration shows, et cetera.

Also other uses of the electric current include that for heating the stoves or ranges for cooking the meals of the crew, electrical triggers or release mechanisms for discharging the torpedoes through the torpedo tubes, and which are propelled out of the tube by compressed air from an air storage tank in most cases. Also a small but powerful electric searchlight is provided on the upper deck of the submarine, which can be used when she is cruising on the surface, and duplicate installations are made; on the upper deck as well as on the inside central control deck where the commanding officer stands

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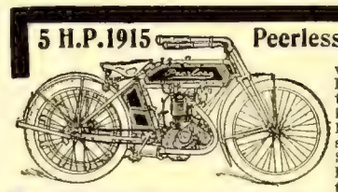

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of the latest type electrically-driven gyroscopic-compass.

The submarine also has suitable running and signaling electric lights at her masthead. The steering is done by electric motor control and the boat carries an electrically driven capstan and other refinements such as electrically vibrated submarine signal to be used in case of distress, etc., and which sends out powerful vibrations through the water which may be picked up by the mother ship of the flotilla.

The modern submarine is, furthermore, equipped now with a complete telephone installation as well as speaking tubes from the officers' central control deck, so that orders may be transmitted from the commander's position before the periscope to any part of the boat instantaneously. It is now common practise to fit the submarine with an auxiliary electric lighting system equipped with 6-volt portable lamps and storage battery as well as dry battery, in order to operate same for several hours in cases of emergency.

In time of war it is thus seen that the submarine commander has a very highly perfected and centralized means of control which is at his fingers' ends, so to speak. When he has sighted a warship of the enemy which is to be torpedoed, which sighting is done by coming to the surface for a few minutes so that the periscope projects above the water a foot or so, he then gets the range and swings the submarine so that one of her torpedo tubes is pointed in the proper direction at the enemy ship. He can then press an electric button which controls the compressed air discharger of the proper torpedo tube, and he will then, and generally does, submerge instantly.

All of this may sound complicated, but as a matter of fact it only requires a few seconds, or at most a few minutes, to bring the submarine torpedo tubes into the proper angle to hit the enemy's ship, momentarily rising to the surface so that the periscope will give a view of the target for range-finding so as to accurately discharge the torpedo.

In most cases, before the gun pointers of the warships can discharge any shells at the submarine it has sunk from view, and the next minute they may be hit by the terible torpedo, which has the power, in most cases, to quickly sink the most powerful and heavily armored dreadnought afloat. The torpedoes fired have a range of two to three miles and even more in some types. It should be noted that our illustration does not show every detail, such as chairs, tables, bunks, etc., as these are outside the scope of this treatise.

MARCONI INJUNCTION HOLDS.

Judges Lacombe, Ward and Rogers, sitting in the Circuit Court of Appeals, handed down a decision recently affirming the order of Judge Hough granting a preliminary injunction to restrain the de Forest Radio Telephone & Telegraph Co., the Standard Oil Co. of New York and Lee de Forest from infringing the fundamental Marconi and Lodge patents relating to wireless telegraphy.

It had been urged by the defendants that it was unfair that they should be restrained from the use of the de Forest system pending the determination of the patent action brought by the Marconi Wireless Telegraph Co., on the ground that the Marconi people had recently raised the price it charged steamship companies for the use of its system to $100 a month for each vessel.

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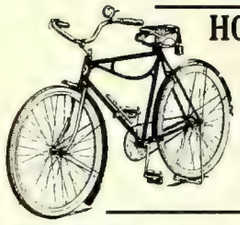

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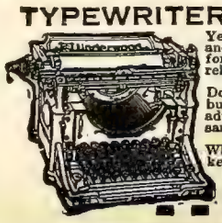

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Advertisements in this section 4c. a word for each insertion. Count 7 words per line.

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Ten per cent. discount for 6 issues, 20 per cent. discount for 12 issues from above rate. Objectionable or misleading advertisements not accepted.

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360 POPULAR TOASTS. Selections suitable for all occasions; just what you need at an evening supper; 10c. "Km.," Wedge Manufacturing Co., Binghamton, N. Y.

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PIGEONS—The finest Pigeon Magazine, $1.00 a year, or send 25c. for four months' trial. Pigeons Magazine, 948 Advertising Bldg., Chicago.

MODERN Dances—Best Instruction Book for beginners. 17 dances fully illustrated. 25c. prepaid. Danse Publishing Co., 500 Fifth Ave., New York.

HAVE YOU SEEN A COPY?—Amateur Photographer's Weekly, $1 per year; weekly prize competitions; criticisms; print exchange; illustrated; many features. Three months' subscription 25c. Amateur Photographer's Weekly, 915 Schofield Bldg., Cleveland, Ohio.

ENGINEERS' questions and answers for license by Hobson for 25c. postpaid. Send stamps. Reilly's Book Store, Dept. E., Philadelphia, Pa.

BICYCLES AND MOTORCYCLES

CLOSING Out Sale high-grade slightly used motorcycles. We have about 50 left to sell, in standard makes which we are offering at big bargains, such as twin and single-cylinder Indians, Yales, Harley-Davidsons, Merkels, Thors, Excelsiors, Popes, 4-cylinder Hendersons and Pierces. These motorcycles we want to close out this year. No reasonable offer will be refused. Write to-day for our list giving description and prices. Gotham Sporting Goods Co., 57 Warren St., New York City.

FOR Sale cheap. 1914 Harley-Davidson twin. Write for particulars. Walter Goerke, 321 Washington St., Newark, N. J.

1908 H. D. SINGLE with clutch and magneto, $30. 1910 H. D. battery model. A-1 condition, $35. 1911 H. D. single magneto model and clutch, $40. 1910 H. D. clutch and magneto, $45. 1 Indian motorcycle motor with magneto and Schebler carburetor, $25. 1 Excelsior motorcycle motor, $25. C. H. Lang, 1704 Michigan Ave., Chicago, Ill.

$50 TO $150 buys the best Motorcycles, every make and model in our large stock—must be cleared. Half price. Send for list to-day. Talking Machines, $5 and up. Brown Music Co., 9119 Commercial Ave., Chicago, Ill.

SEND for latest Bulletin of real Motorcycle Bargains, used and slightly used, all makes, models and prices; if you have $25 and really want a powerful Motorcycle, send for this Bulletin; hundreds of machines at all prices, new ones on easy payments; tell us what you want and how much you can pay; we can fix you up. Peerless Motorcycle Co., Dorchester, Mass.

USED Motorcycles, all makes, bargains. Send for list. Ward Bros., 212 Broadway, Camden, N. J.

OUR folder showing the new '15 Eagle 2-speed models is ready for mailing. Write for this and for the agency to-day. Sterling Motor Co., Brockton, Mass.

RIDERS: Write for our catalogue of motorcycle accessories and supplies. Andrews Specialty Co., 55 Warner St., Rochester, N. Y.

* * * * * * * * * * *

Brooklyn, N. Y., April 15, 1915.

Gentlemen:—The results obtained from my advertisement in the "Electrical Experimenter" really surprised me; in fact the demand for a certain instrument of mine exceeds the capacity for manufacturing and it is all through the "E. E." To date, 79 inquiries, 12 orders. Might state last week filled a $50.00 order netting me a profit of $18.75. As to the exact value of my orders to date, I prefer not to give figures; however, you will always see my ad, month in and month out. I can truthfully say that the "E. E." has it on them all, viz., for quick results, interesting reading matter, etc. Very truly yours. HARRY Y. HIGGS.

* * * * * * * * * * *

FORMULAS

GOLD, SILVER, Invisible and Luminous Inks. Formula, 10c.; 4 for 30c. J. Bryon Long, Salem, Ia.

1,000 TRADE secrets and formulas, 25c. 500 selected formulas, 20c. Resilver mirrors, guaranteed process, 20c. Make Sneezing Powder and Itch Powder, 10c. each. Entire lot, 50c. Service Bureau, 3111-T, Belleplaine Ave., Chicago.

MAKE Candy evenings; pays; receipt, 10c. Elmer Zimmerman, 1435 Walnut, Harrisburg, Pa.

ANY FORMULA WANTED—Sent for 20c. 3 Invisible Ink formulas, 25c. State requirements to Kelson Laboratory, Box 433, Elmwood, Ill.

SIX Valuable formulas for sympathetic inks, 50c. Wayne Thomas, Ithaca, N. Y.

FORMULAS for inks, black, blue, red, gold, green, silver, indelible, 15c each. 7 for $1.00. Stephen Rafferty, 2122 Arch St., Philadelphia, Pa.

CUTS anybody can make, 5c. Samples Stamp. Modern Engraving Co., Lynn, Mass.

AGENTS—Build a business of your own with our Piano and Furniture Polish. Have used it in our shop successfully for five years. Send $1.00 for formula and trade secret. E. E. Lundberg School Piano Tuning, 143 N. Dearborn St., Chicago.

PHOTOGRAPHIC

FILMS developed, all sizes, 10c. Prints, any size, 4c. each, 35c. per dozen; double weight paper used; needs no mounting; post cards same. E. H. Flowers, North Platte, Neb.

SPOT Cash paid for high-grade Kodaks, Lenses and Cameras. Send full description, stating lowest price. Cameras exchanged. In business since 1885. David Stern Co., Dept. M, 1047 W. Madison St., Chicago.

FILMS developed, 10c., all sizes. Prints 2¼x3¼, 3c.; 2½x4¼, 3½x3½, 3¼x4¼, 4c.; Post Cards, 50c doz. Work guaranteed and returned 24 hours after receiving. Postpaid. Send negatives for samples. Girard's Commercial Photo Shop, Holyoke, Mass.

EXPERT Kodak Finishing! Send for price list. Electric Studio, 162 Stephenson St., Freeport, Ill.

KODAK films developed. 5c., all sizes. Prints, 3c. each, any size. P. Johnson, 100 W. Bridge St., Oswego, N. Y.

TRANSFER pictures to china, etc.; no formulas; particulars. Flinn, 286 West 142nd St., New York City.

THINK OF IT! Only $20 for finest German Double Anastigmat in Ibso shutter, for 3A Kodaks and postal card cameras. Send for matter describing best Lenses on earth at way down prices. Lafbury Co., 305 North Fifth Ave., Chicago.

FILMS developed 10c., all sizes, prints 2¼x3¼, 3c.; 2½x4¼, 3½x3½, 3¼x4¼, 4c.; Post Cards, 50c. dozen. Work guaranteed and returned 24 hours after receiving. Postpaid. Send negatives for samples. Girard's Commercial Photo Shop. Holyoke, Mass.

$54 CENTURY Grand, bargain, $25. Magnificent Ensign Reflex, Zeiss Triotar Anastigmat, complete, $65. $22.50 Autographic Kodaks, $19.75. Slipin Calender Mounts, assortment, $1. Catalogues mailed. Newark Photo Supply Co., Newark, New Jersey.

HEADQUARTERS for selling or exchanging Cameras of all kinds. Carry a full line latest Kodaks. Graflex. Premos, foreign Cameras. Write for big bargain list. Gloeckner & Newby Co., 171 Broadway, New York.

KODAK Films Developed, 10c. per roll, any size. Prompt attention given mail orders. Prints, 2¼x3¼ to 3¼x4¼, 3c.; 4x5 to 3¼x5½, 4c. J. M. Manning, Box B, 1062 Third Ave., New York City.

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MAGIC pocket trick free. Worth 25c. With illustrated catalog of 250 tricks, puzzles, illusions, for 6c. Stamps. Magic Co., Sta. 10, 249 West 38th St., New York.

POST Cards, Tricks and Jokes, Coins, Notes, Stamps and curious things. Catalog for stamp. Coin Exchange, New Rochelle, N. Y.

BIG Catalogue. Magic, Entertainment goods free. Bates Co., Melrose, Mass.

MAGIC Tricks, Jokes and Puzzles. Trick with my catalogue, 10c. coin. H. V. Dils, Huntington, W. Va.

GREAT book wonders, secrets and mysteries and novelty catalogues, 10c. Wright Spec. Co. (D), Brewster, N. Y.

MAGIC tricks for the profession. Big catalogue and pocket trick free. Ventriloquial figures, $6.00 up. Magic Parlors, 192 Clifford, Providence, R. I.

NOVELTIES, Books, Tricks, Games, Etc. Illustrated catalogue free. Sample 25c. card trick, 10c. Auburn Supply Co., Specialty Dept., 7745 Peoria St., Chicago.

SECRO-WRITO; New System of secret writing. Keeps your correspondence safe and private. Strangers cannot read your cards and letters. Great fun for everybody. Samples and instructions, 10c. H. J. Teeple, Decatur, Indiana.

GREENBACKS—Yellowbacks, Stage money. New kind, 10c. bunch; 4—25c. Eureka Supply, P29, 3827 N. Kenneth, Chicago.

250 MAGIC Tricks with cards, coins, etc., 10c. Greenbacks, big wad, 10c. Novelty Shop, 3311-T, Belleplaine Ave., Chicago.

MISCELLANEOUS

ENGINE Lathe, swings 9½ in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., $43.50. Grammes & Sons, Allentown, Pa.

MANSFIELD'S Electrical Water Finder is a thoroughly reliable appliance for locating positions for sinking wells for pure water supplies. Send for particulars to Mansfield & Co., Engineers, New Brighton, England.

ELECTRIC Light Plants, consisting of ⅛ H.P. gasoline engine, 60-watt dynamo, switchboard with volt and ammeter, lamps, wire, switches, etc., complete, $32.50. Descriptive Bulletin for stamp. Dynamic Manufacturing Co., 1730 First National Bank Bldg., Chicago.

DRAWINGS made for inventors. Consulting Engineer, EE-3240 Seminary Ave., Chicago.

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MODELS made for inventors; general machine work; designing and perfecting; developing automatic devices and machinery; in a position to do all kinds of light tool and machine work. Prices reasonable; estimates cheerfully given. Ideal Machine Works, 62 Ann Street, New York City.

INVENTORS: We manufacture metal articles of all kinds to order. Also special machinery, tools and dies; punchings, lathe and screw machine work, metal spinnings, castings, plating, wood and metal patterns, etc. Send sample for estimate and expert advice, free. The Eagle Mfg. Co., Dept. E, Cincinnati, Ohio.

SMALL Gasoline and Steam Engines and Castings. Experimental apparatus. Toys. Big catalogue for 10c. Amateur Mechanics Co., First National Bank Building Chicago.

PRODUCERS of Results; Inventions Developed, Light Mfg., Models, Experimental Work, Tools, Dies and Stampings. Johns Machine & Stamping Works, Middle Bldg., Dept. C, Cleveland, Ohio.

MODELS, dies and manufacturing for inventors, by builders of "Tools That Work." La Croix Tool Co., 214 N. 21st St., St. Louis, Mo.

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PATENTS without advance attorney's fees. Not due until patent allowed. Send sketch for free report. Books free. Frank Fuller, Washington, D. C.

PATENTS SECURED OR FEE RETURNED. Send sketch or model for free search and report. Latest complete patent book free. George P. Kimmel, 254 Barrister Bldg., Washington, D. C.

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STAMP Album with 538 Genuine Stamps, incl. Rhodesia, Congo (tiger), China (dragon), Tasmania (landscape), Jamaica (waterfalls), etc., 10c. 100 diff. Jap., N. Zld. etc., 5c. Big list; coupons, etc. Free. We buy stamps. Hussman Stamp Co., St. Louis, Mo.

GET the most out of your money you can. Try my 1, 2 and 3-cent approvals and you'll be pleased. References required. Wm. Haase, 971 E. 39th St., Los Angeles, Cal.

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$4.25 EACH paid for U. S. Flying Eagle Cents dated 1856. Hundreds of other U. S. and Foreign Coins wanted. Send 10c. at once for New Illustrated Coin Value Book 4x7. It may mean your good fortune. Clarke Coin Co., Box 94, Le Roy, N. Y.

MAIL ORDER OPPORTUNITIES

EVERYTHING in the mail order line; state your wants and we will do the rest. Pacific Specialties Co., Los Angeles, Cal.

EUROPEAN War Map and chances to start a profitable business of your own, 10c. C. S. Mathews, 69 East 87th St., Portland, Ore.

WE will start you in the cleaning and dyeing business. Little capital needed. Big profits. Write for booklet. Ben Vonde System, Dept. A-K, Charlotte, N. C.

WIRELESS

$10.00 COMMERCIAL KEYS for $4.00. Massie Wireless Telegraph Co., Providence, R. I.

EXCEPTIONAL Radio Apparatus. A 2c. stamp will bring my literature. H. Y. Higgs, 30 Irving Pl., Brooklyn, N. Y.

WE make Loose Coupler, 2,500 meter, $5; Tuning Coils, 350 meter, $2. Cliff Mfg. Co., Box 130, Brookfield, Mass.

AUDION Amplifier Hook-up. Marvelous! Uses one Audion only; Wireless Arcs, any size, Poulsen or Collins type; Inductance capacity, Wave length, Chart; Blueprints either one, 20c. H. Winfield Secor, Consulting Engineer, 2040 7th Ave., New York City.

AERIAL Masts: Build a "SU-PER-FECT" mast. Information 230 Stuyvesant Ave., Brooklyn, N. Y.

WIRELESS Operators: Send 10c. for any two name plates, "Phones," "Ground," "Aerial," "Battery." Carl Rhapstock, Plainfield, Wis.

3 CHARTS—Inductance of any coil, wave length of antennas, proper condenser for different spark-frequencies and voltages; sent, postpaid, for $1. A. S. Blatterman, B.Sc., 45 Lewis Pl., St. Louis, Mo.

BLITZEN Receiving Set, phones, other wireless instruments; perfect condition; half price. E. F. Rybolt, Dayton, O.

Scientific Exchange Columns

UNDOUBTEDLY you have at the present time some things for which you have no further use. Do you wish to sell these things or exchange them for something, for which you have immediate use? There is no surer and quicker way to do this than by advertising your articles in these columns. The **Very** people, the **Only** people, who could possibly have a use for your things read this journal. More than 30,000 interested people will see your ad. It is furthermore the cheapest advertising medium for you in the country.

The rates are: One cent per word (name and address to be counted) minimum space 3 lines. Count about 7 words to the line. **Remittance must accompany all orders.**

We reserve to ourselves the right to refuse any advertisement which we consider misleading or objectionable. Advertisements for the August issue should reach us not later than July 10th.

The Classified Columns of "The Electrical Experimenter" Bring Positive Results.

EXCHANGE—Bicycle and 2 frames, 1 Mandelete Camera outfit, 6 Pekin ducks, 8 aerial insulators, back numbers "Youth's Companion" for 4 years and story books. J. Royalton Smith, Osborne, Kan.

TWO wireless keys, 4 ohm W. U. sounder; cost $14. Exchange for Kodak. William Hyer, 314 S. 10th St., Philadelphia, Pa.

FOR EXCHANGE OR SALE—Loose coupler, variable condenser, fixed condenser, pair 2,000 ohm phones, detector, ½-in. spark coil, aerial wire, insulators, etc.; also battery motor, auto coil with magneto and battery switch. Will sell cheap or exchange for good motorcycle motor. Morris Ivy, 613 S. Anna St., Stuttgart, Ark.

FOR SALE—New and used wireless goods, such as 100-a, 600 V. slate base switches, $2.75, and Type A-A Crystaloi and test buzzer, $5.90. Send 2c. stamp for big list. All letters answered. A. Leroy Jennison, 83 Russell St., Waltham, Mass.

SALE OR EXCHANGE—Model self-inking hand printing press, No. 2, chase 7x9 in. Bought power press, have no further use for this. A money-maker. Dependable wireless apparatus for sale. Lloyd Gross, Pitman, N. J.

FOR SALE—3 headsets, 3 coils, 2 receiving, 2 battery motors, coupler, telephone, 2 telegraphs. E. R. Hough, Johnstown, N. Y.

WILL EXCHANGE pair 1,500 ohm receivers for Audion detector. Cash for broken Audion bulbs; have heavy lightning switch, magneto. Horton, 230 Stuyvesant Ave., Brooklyn, N. Y.

TWO Sliding Plate variables, $3; 2,000 ohm headset, $3; both, $5. Platt, Wentworth St., Bridgeport, Conn.

FOR SALE—Wireless instruments. For prices write Arthur Sacha, 3670 E. 40th St., Cleveland, O.

WILL TRADE—Motorcycle Gas Tank and two Speedometers for wireless goods. What have you? R. H. Leffler, Tiffin, O.

WILL SWAP—New Ingersoll Junior Watch; never used. What have you electrical? Loose Coupler preferred. Box 165, Waverly, Va.

FOR SALE—One Bb Clarinet, $7; one Bb Clarinet, $40; one Premo Camera with portrait attachment, nearly new, $8; one pair Opera Glasses, new, $4. Roy Jackson, Colome, S. D.

3100 Broadway, New York City,
5-29-'15.

Gentlemen:—

It may interest you to know that in answer to my advertisement in your Scientific Exchange columns, I have received to date fourteen answers, selling instruments to second inquirer. Either your paper is extra good or my price was too low.

HAROLD B. ADAMS.

FOR SALE—3,000 ohm Holtzer-Cabot receivers; brand new; have been used two weeks; $8. Write George D. Todd, Jr., New Albany, Ind.

FOR SALE—Loose Coupler, Silicon Detector, Fixed Condenser, Variable Condenser, 2,000 ohm phones and ½-in. spark coil, gap, 2 keys, condenser, nickeled headband, load coil, switch block. Harry H. Bonney, 103 S. Spruce St., Pana, Ill.

FOR SALE—One Professional Type Audion Detector, listing at $50; also cabinet type loose coupler, 2 condensers, Marconi phones and 2 crystal detectors. Will sell entire outfit for $50. L. Winat, 8-10 E. 107th St., New York City.

HAVE Blitzen Receiving Set; 2,000 ohm phones; many other wireless instruments; X-Ray outfit; 2-in. spark coil; write for list. What have you? R. F. Rybolt, Dayton, O.

FOR SALE—One ¼-in. Spark Coil; also other electrical novelties and supplies; will sell cheap. Write Kenneth Linnard, Peotone, Ill.

WILL sell 4-in. Electro Water Motor, coupling for plain faucet and 6-volt pony dynamo for $5.00. All brand new. E. Turner, 230 Hart St., Brooklyn, N. Y.

FOR SALE—Violin and Bow; new Stradivarius model; fine selected wood; genuine ebony trimmings; good tone. Price $6, prepaid. Luther M. Wiford, Sidney, O.

FOR SALE—Murdock 2,000 ohm, $5 head phones; perfect condition guaranted. First offer of $2.25 takes them. Raymond Schlegel, 1118 N. Negley Ave., Pittsburgh, Pa.

FOR SALE—A few steam and electrical books at half price. Henry Priebe, Kent, O.

VARIABLE Rotary Condenser, 31 plates and a pair of 2,000 ohm phones for a good camera or offers. H. Butterworth, 15 Kosciusko St., Brooklyn, N. Y.

EXCHANGE—Violin with canvas case, Harmonica, Flashlight, Books, Bicycle Lamp (gas); all in excellent condition. Will exchange for good Wireless Set. J. G. Schroeder, Wisner, Neb., Box 31.

FOR EXCHANGE—One E. I. Co. Tesla Transformer Coil, cost $5.50. Will exchange for Radioson Detector. Must be in good condition. Louis Menier, 526 E. 85th St., New York City.

TRANSATLANTIC Receiving Set, composed of the following instruments: Galena Detector, Radioson Detector, Loose Coupler, Variable Condenser, Loading Coil, Junior fixed Condenser, Variable fixed Condenser, pair of 3,000 ohm Government phones. Case to carry instruments. Set has never been installed. Cost $33.50; will sell for $15 or a good kodak; state style. J. Mitton, 377 Sickles St., Philadelphia, Pa.

¼ H.P. Gasoline Engine, suitable to run a generator, scroll saw, washing machine; bought four weeks ago; cost $23. As I need the money I will sell it for $16, or make an offer; good as new. J. Mitton, 377 Sickles St., Philadelphia, Pa.

2—¼-IN. Coils, good Punching Bag and Platform, 1 Vibrator, 1 Magneto. Want most any good radio instrument. Want offer. Ross J. Plaisted, Penn Yan, N. Y.

FOR SALE—Complete 1 K.W. Transmitting set, $20. Under ordinary conditions this set will send 50 miles. This set is similar to that of the Electro Importing Co.'s No. S.O.-200 outfit and is in excellent condition. Also have a 1½-in. Bulldog Coil, $3. Would like to exchange photos of radio station. Cecil Bridges, Louisville, Ill.

EXCHANGE—E.I. Variable Box Condenser, good as new. Will exchange for transparent 43 plate Variable Condenser. Louis L. Brandmeyer, Jr., Watertown, Conn.

FOR SALE—4 H.P. Steam Engine, horizontal style, $25; worth double; Rayfield Carburetor, fine condition, $9; new loud Auto Horn, $4. Bargains. Peter Nowak, 941 Merrill St., Milwaukee, Wis.

THE NEW
MURDOCK SPECIAL No. 55
WIRELESS RECEIVERS

With Regular Head Band

Complete 2000 Ohm Double Head Set

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Absolutely high grade real wireless receivers, equal in sensitiveness, quality of materials, and dependability to any obtainable anywhere at many times the price.

We will, upon receipt of price, deliver a Murdock Special set, with the privilege of fourteen days trial. If for any reason the purchaser is dissatisfied, either with the receivers or our claims, the purchase price will be immediately refunded upon return of receivers.

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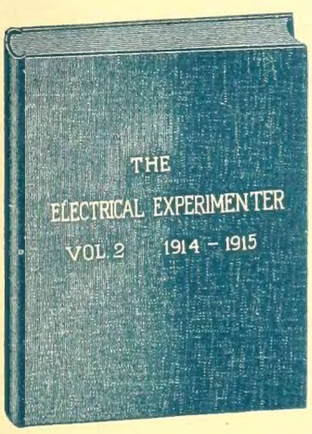

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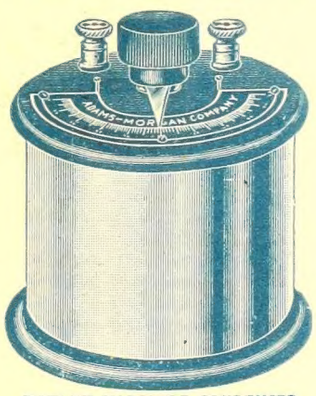

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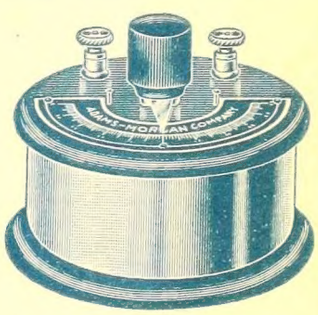

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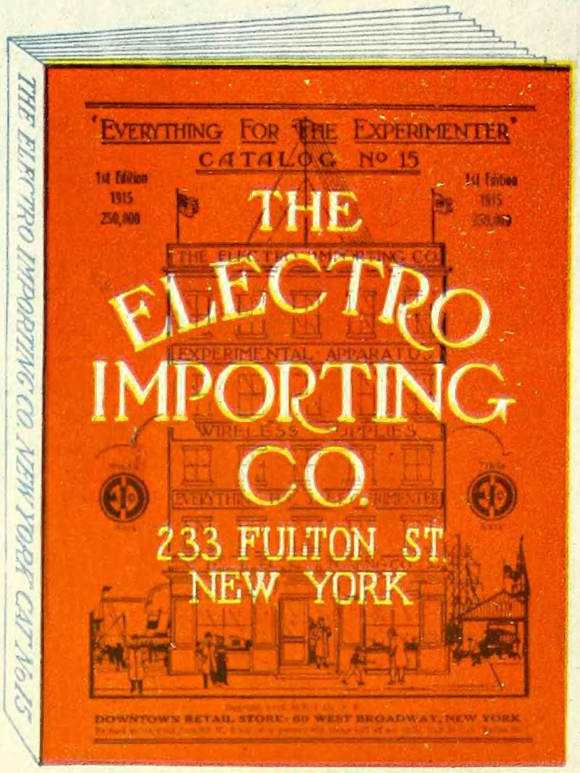
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